WIRE AND WIRE PRODUCTS

JUNE 1955

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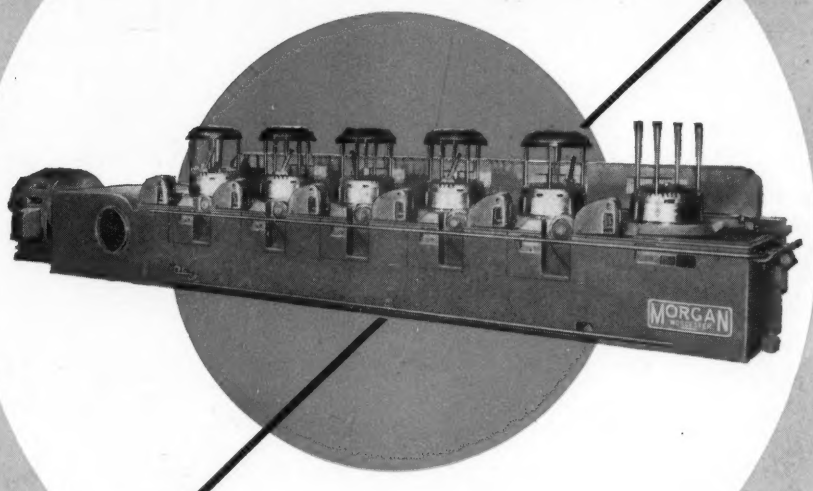
AT LOWER COST...



HIT THE MARK

WITH MORGAN-CONNOR

WIRE DRAWING MACHINES

MORGAN CONSTRUCTION COMPANY • Worcester, Mass.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

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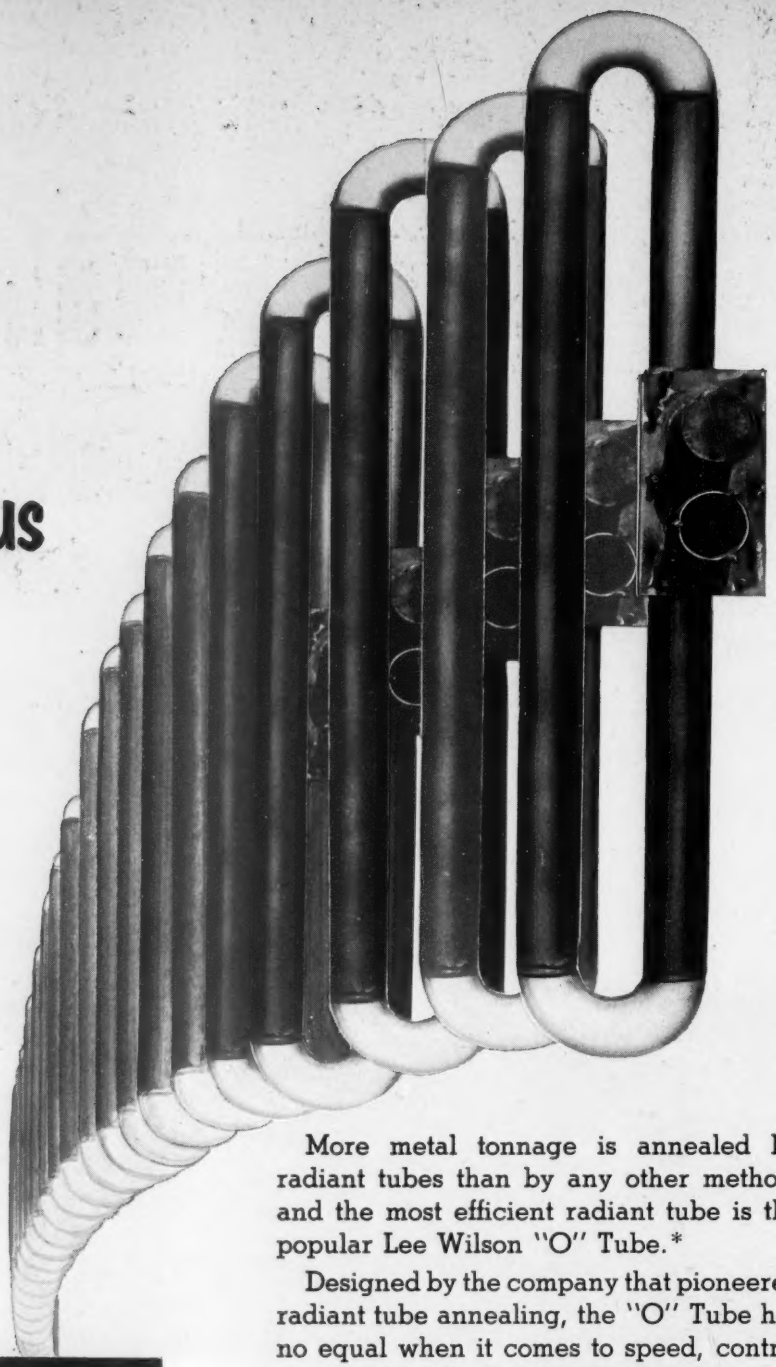

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Lee Wilson

"O" Tube

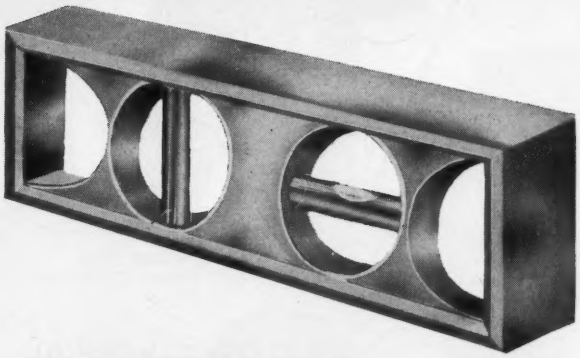
More metal tonnage is annealed by radiant tubes than by any other method, and the most efficient radiant tube is the popular Lee Wilson "O" Tube.*

Designed by the company that pioneered radiant tube annealing, the "O" Tube has no equal when it comes to speed, control and useful life. Its development was responsible to a great degree for making the Lee Wilson Single-Stack the fastest selling wire and rod annealing furnace on the market today.

*Now standard equipment on all Wilson wire annealing furnaces.

LEE WILSON ENGINEERING COMPANY, INC. • 20005 West Lake Road, Cleveland 16, Ohio

For Production on an even level !!!



DEPEND ON

"America's Finest Wire Drawing Lubricants"

One Hole X Bright 30/33

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3-4-5-6 Hole X-BRIGHT 105-108-110-224-301

MULTI-DRAWING 88-POWDER ALUMINUM & ALLOYS

ALLOYS-ROPE-PROCESS-TIRE BEAD 55 NETTING ULTRA HIGH SPEED High & Low Carbon STAINLESS

93 204TS 230 91 Nails Lime & Borax Coat

Compact Bundles Greater Frame Capacity 21-WAX Finest on Galv. Wire For Protection

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No. 4 Spark Tester
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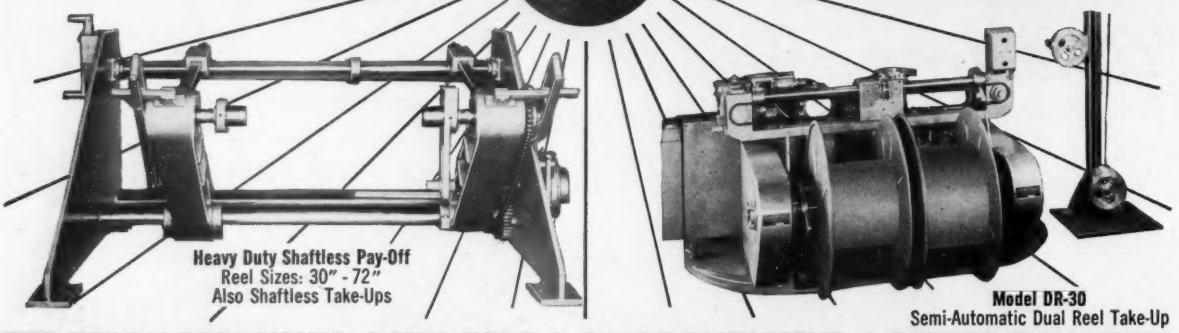
CV Type Sparker
For Continuous Vulcanizing
or Plastic Extruding

FOR ACCURACY — DAVIS WIRE & CABLE EQUIPMENT — FOR DEPENDABILITY



Heavy Duty Shaftless Pay-Off
Reel Sizes: 30" - 72"
Also Shaftless Take-Ups

Model DR-30
Semi-Automatic Dual Reel Take-Up

THE NEWLY REDESIGNED *DAVIS WIRE & CABLE EQUIPMENT* IS BETTER THAN EVER

Modernized, streamlined and engineered for fast production of safely insulated wire and cable, the newly redesigned DAVIS ELECTRIC line of Spark Testers, Pay-Offs, Take-Ups, Counters, Spoolers, Traverses and Capstans is now offered as the finest ever conceived and produced by DAVIS ELECTRIC engineers. Before you buy, you owe it to your pocketbook as well as your business reputation to learn what this unexcelled machinery can do to better satisfy your customers (and your stockholders!). Refinements and advancement in designs qualify the 1955 DAVIS ELECTRIC line to surpass in performance previous DAVIS products in use in 80% of the industry's wire mills and some of which have been in operation for 15 years without maintenance problems!

What better tribute to quality can one ask?

Write for complete details and find out how DAVIS ELECTRIC can improve your wire and cable production and promote profit in your plant.

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WIRE & CABLE
EQUIPMENT

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WALLINGFORD, CONN., U.S.A.

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SPARK TESTERS ★ SPOOLERS ★ TAKE-UPS ★ CAPSTANS

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30-KW Drever 12 tube furnace with 9 foot heating chamber. Capacity 85 lbs./hour (.020" wire); speed 50 to 200 feet per minute.

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STAINLESS WIRE

Clean Bright high quality stainless or alloy wire is heat treated economically in Drever Continuous Bright Annealing Furnaces.

Versatility of production is possible by design of pay-off and recoiling mechanisms. Each block is driven individually, thus wire of different diameters may be annealed at varying speeds at the same time.

Proper atmosphere equipment is supplied depending on type of wire to be bright annealed.

Write for further details on this or other type of Drever Furnaces.

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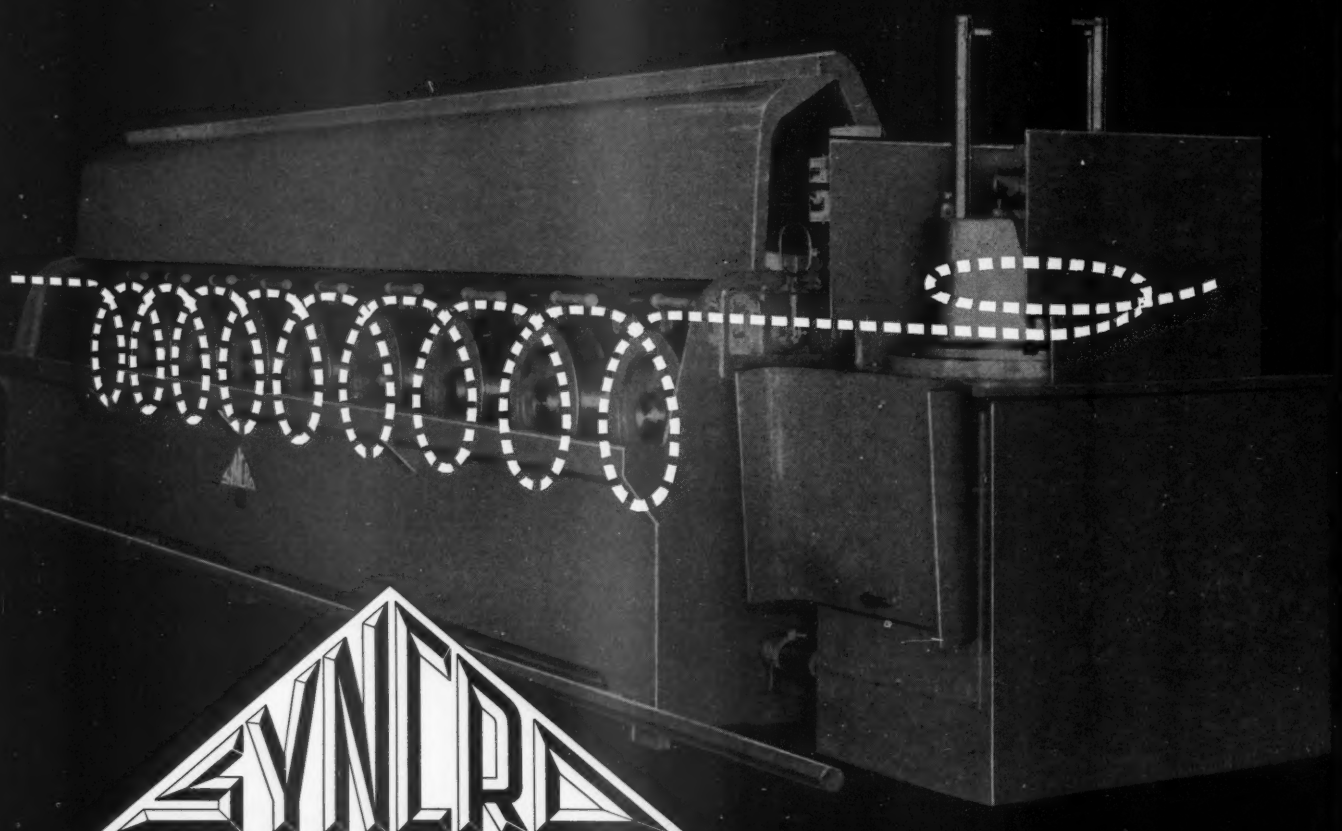
For Heavy Wire drawing in copper, aluminum and their alloys,
Syncro's complete line of tandems
permit the utmost drawing versatility at maximum speeds.
Syncro Tandems are widely used with all models of Syncro spoolers,
thus providing wire drawing and spooling at speeds up to 5000 feet per minute.
Maximum Rod entry size up to ½'' diameter (soft copper).



SYNCRO

Better Machinery for the Wire Industry

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WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 30 June, 1955 No. 6

Designated as Official Publication By The Wire Association

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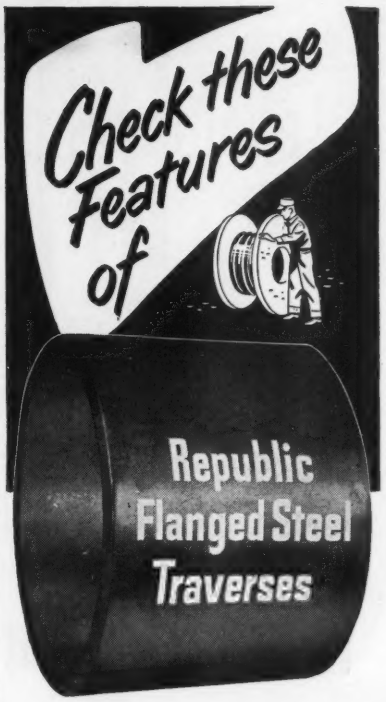

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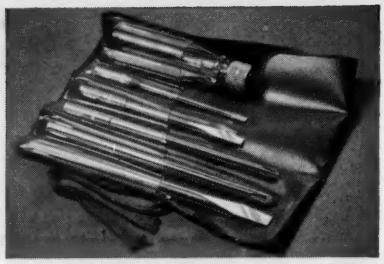
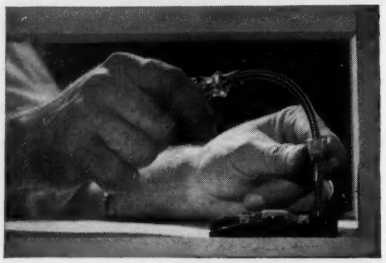
Attractive screw-driver kits include an unbreakable plastic handle and a selection of blades for the handyman's pocket.



The flexible wire shaft of this handy model makes it easy to get at screws when there's no elbow room to spare.



making millions of screw drivers for the nation's handymen

A visit to the busy plant of Oxwall Tool Co., Ltd., at Oxford, N. J., is one to make the handyman's eyes gleam. Here he sees more sizes and varieties of screw drivers than he ever dreamed of. Small ones, big ones, and a variety of special types. Many are packed in attractive kits and sold all over the world.

Oxwall is a large user of Bethlehem special-purpose screw-driver wire in round and square sections, and supplied in both carbon and alloy grades.

Bethlehem makes just about every kind of steel wire. And we control the entire steelmaking process from mining the ore right down to the final drawing of the wire. Some are general-purpose grades; others, like screw-driver wire, are tailor-made for a specific application.

We'll be glad to work with you all the way in helping you to get the most from your steel wire. Just write us at Bethlehem, Pa., or at our nearest sales office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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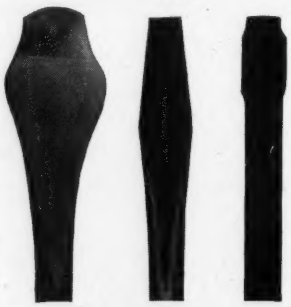

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BETHLEHEM WIRE

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Let us quote on your reel needs. Send your specifications. Better yet, visit our plant and see how and why our reels are made so well at so low a cost.

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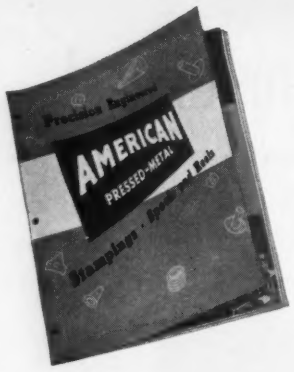

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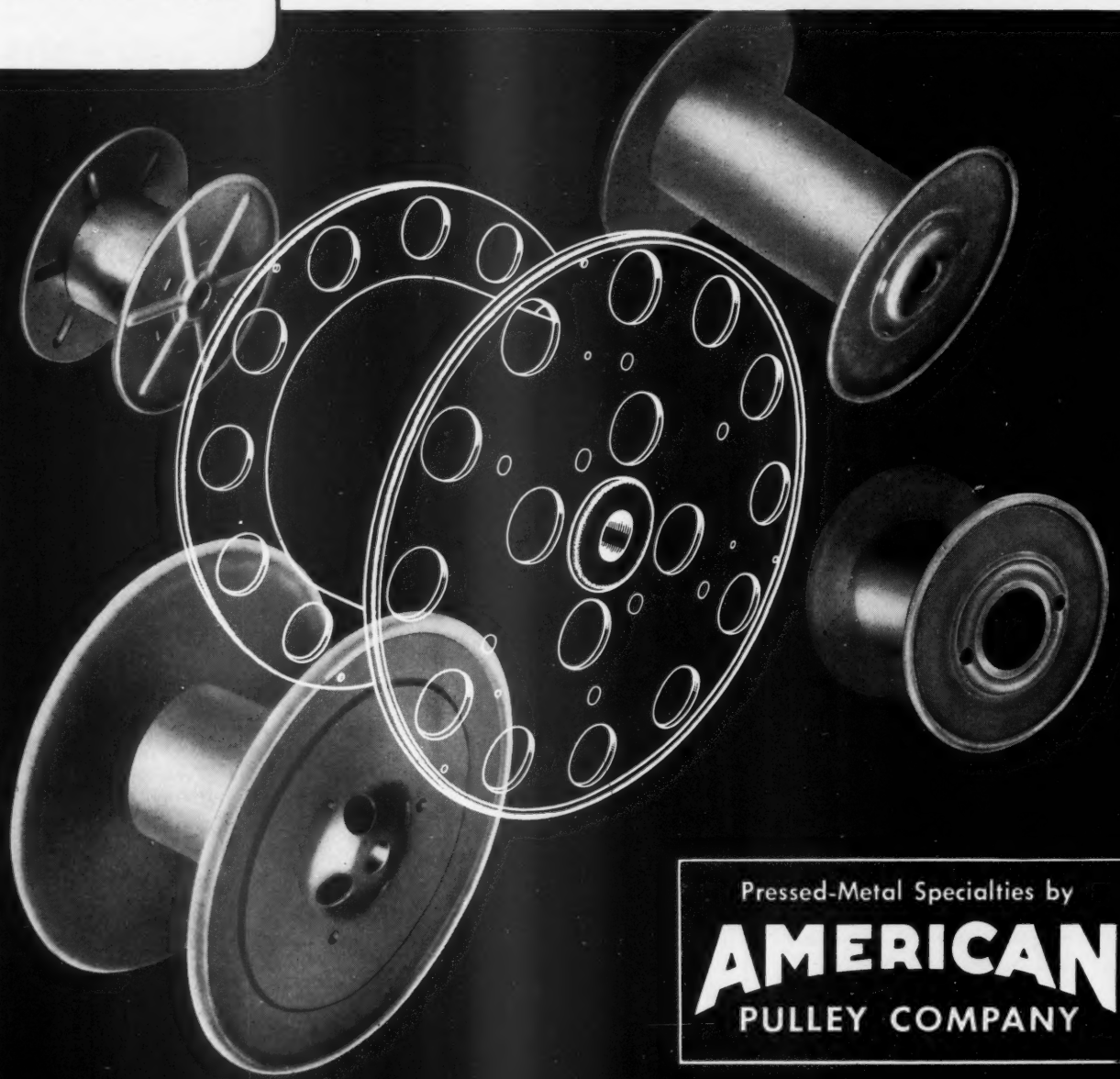

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. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

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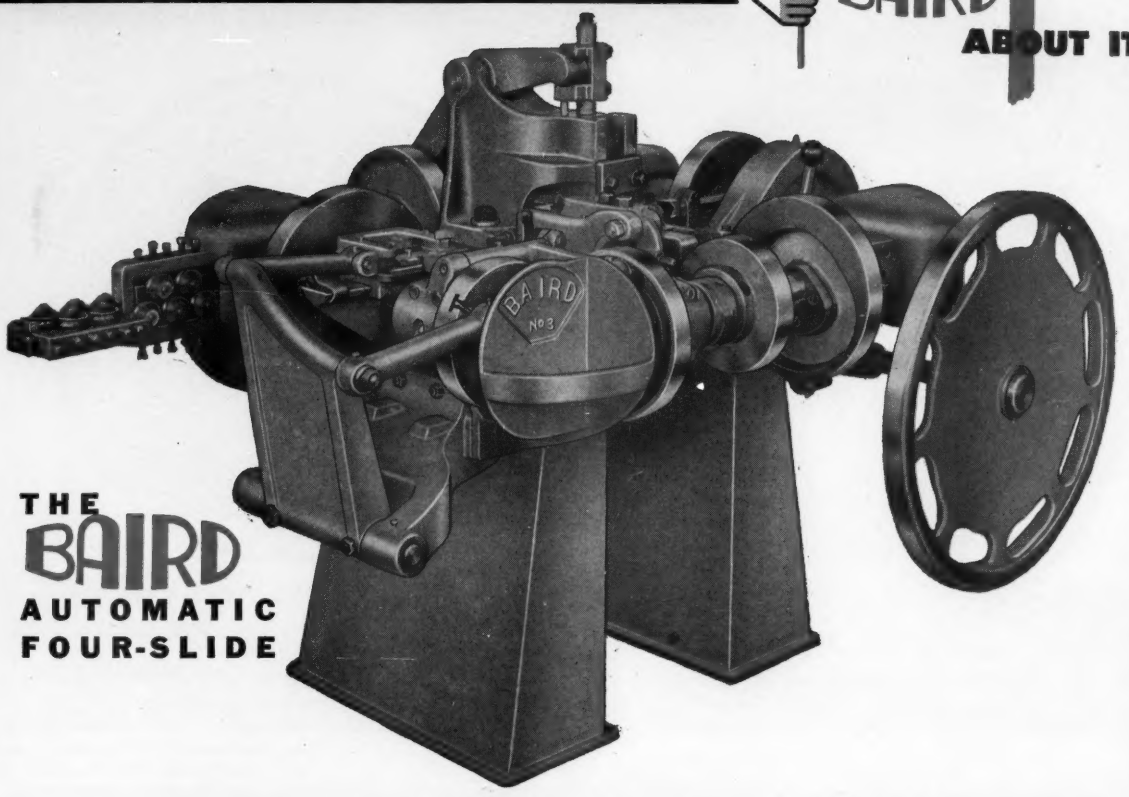

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NO MACHINE IN THE WORLD CAN MAKE A GREATER VARIETY OF PARTS . . . *OR PRODUCE THEM ANY FASTER*

Yet, new wire shapes, formed *by hand,* are continually submitted to us for tooling setups to produce them *automatically* on Baird Four-Slide Machines. We usually solve the problems.

Coiled wire is taken from a reel, is straightened, fed and cut off to the required length . . . then formed and ejected as a remarkably accurate part. The per-minute speed of production is almost unbelievable . . . and the unit cost likewise.

You may purchase your machine tooled for specific repetitive production, then add other tooling and attachments as required to increase the versatility of production of both wire and metal ribbon articles to the greatest degree.

Various sizes of standard machines give you a selection of wire lengths to 32½" . . . dia. to ½" . . . or flat ribbon metal products to 1½" wide.

Baird engineers will develop your tooling from your parts or from blueprints. The Baird Four-Slide Bulletin (Wire or Ribbon Metal) will open new avenues to low-cost competitive production. Your copy on request—write Dept. WP.

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STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

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3BA55

Carbide wire-die user reports . . .

Carboloy R-3 Die resized 20 times

Original Carboloy R-3 Die with .025" starting hole. Normal maximum is .182".

Carboloy R-3 Die after 20 resizes. Final hole is .236" – 30% larger than normal maximum.

STARTING hole size on the Carboloy R-3 Wire Die, above, is .025"; the normal maximum is .182". But our Carboloy customer successfully reground the R-3 to .236" . . . 30% over maximum. Even after the twentieth resize, his wire had the same high quality and precision finish.

Longer die life and superior performance, due to Carboloy built-in quality, are but two of the money-saving "bonus" benefits you get – at no extra cost – with every Carboloy® cemented carbide Wire Die.

Others include: Immediate local delivery, in-plant engineering assistance, die servicing and finishing facilities, technical literature, and die training school for your personnel. Call in an expert Carboloy Wire Die Engineer, today. Or, write for Carboloy Die Catalog and Service Manual.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

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Nuts produced by Lamson & Sessions, Cleveland, Ohio.

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Scrapless Quality Nut Wire with these qualities feeds smoothly through your machines. There is less downtime. Fewer rejects. And severe die wear is lessened.

Next time you order Scrapless Quality Nut Wire, be sure you get Youngstown. It's available in a good range of compositions, including AISI Standard as well as special re-sulphurized steels. For more information, call your nearest Youngstown District Sales Office.

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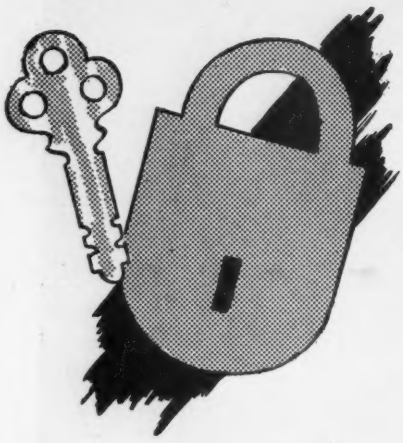

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- **INTERMEDIATE WIRE DRAWING MACHINE**
- **HI-SPEED ROD MACHINE MODEL D-17**
- **TINNING TAKE-UP EQUIPMENT**
- **ENAMELLING MACHINERY**

designers and builders of Quality Machinery for the wire industry

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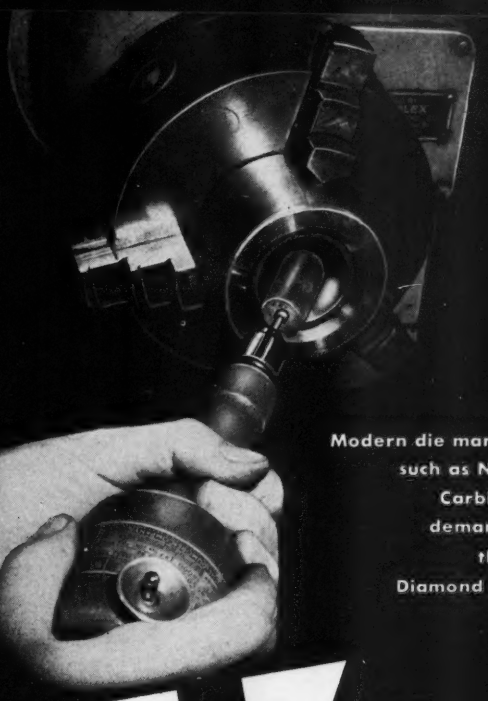
flawless faster die finishing with scientific compounds



Modern die manufacturers such as New Jersey Carbide Die Co. demand Hyprez, the original Diamond Compound

HYPREZ

For economy of production and for finish to exact specification, New Jersey Carbide Die Co. uses Hyprez exclusively

High Precision DIAMOND COMPOUNDS

Serving many of the foremost plants in the wire industry, New Jersey Carbide Die Co., of Jersey City, uses Hyprez exclusively for rough finishing, lapping and polishing tungsten-carbide dies.

The continuing preference for Hyprez is built upon Hyprez superiority—maintained by research and control; by fast free-cutting action of pure diamonds precisely graded and uniformly dispersed in scientifically formulated vehicles. Hyprez provides the exact grade and concentration for every job.

Ask for a free demonstration

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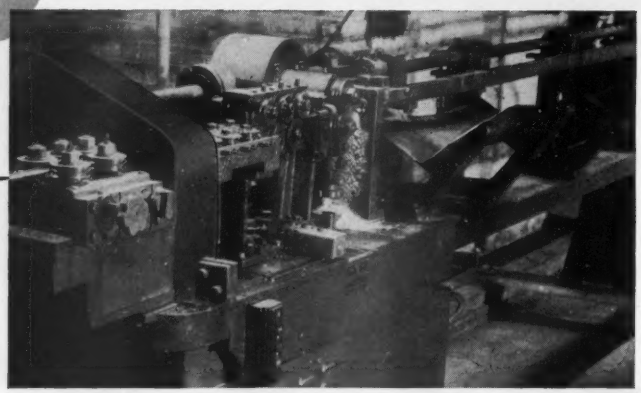
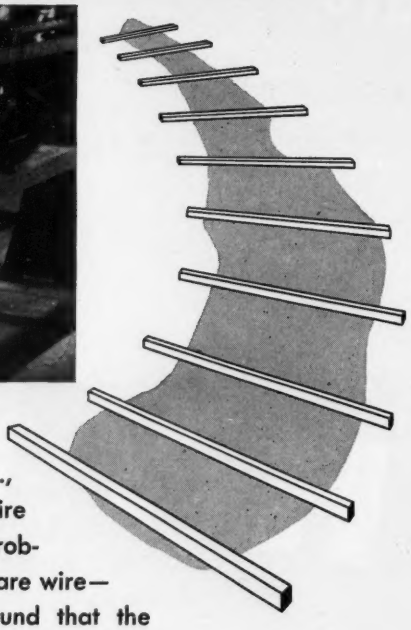
DRISCOLL WIRE SOLVED IT with a SHUSTER



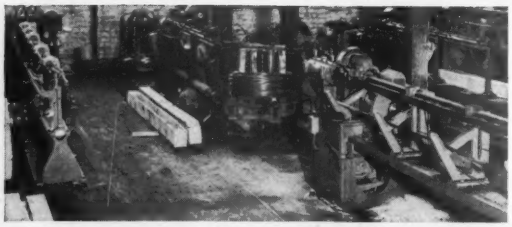
SHUSTER 2ABF in operation at Driscoll.



The Driscoll Wire Co., Shelton, Conn., one of the oldest names in reliable wire manufacture, was faced with the problem of straightening and cutting square wire—for long production runs. They found that the SHUSTER 2ABF was the one, satisfactory answer.

Outstanding features of the 2ABF are: instantaneous operation of clutch and cutoff; movement of wire almost continuous, minimizing marking of the wire and assuring square cut, undistorted ends; although built primarily for square and rectangular wire, the 2ABF will straighten and cut round wire as well; maximum capacity — ¼" sq. & rect. (⅜" round).

Write for our new circular



Fine wire room at Driscoll.

Other sizes available for shape stock and .025" to 11/16" diameter round wire.

Representatives in all principal cities.

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AT

JOHNSON STEEL & WIRE CO.

WORCESTER, MASS.

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Dept. G

ABRASIVES DIVISION

ELGIN NATIONAL WATCH COMPANY

This is how Flamingo Products, Inc., receives wire shipped from Johnson Steel & Wire Co., Worcester, Mass. The 75-pound coils of half oval, bright finish, hard drawn wire are shipped in fiber drums lined with moisture resistant paper.

Steel for Milady's Hair

Problem: To produce 3 million bobby pins daily, each with the right amount of spring, color and ease of opening, takes special steel wire and high speed equipment. Here's how one producer does it.

A new coil is placed on a pin forming machine which will cut the wire to proper length, bend it back on itself, crimp one side with five bends and give one tip a "ski jump" bend.

Heart of the bobby pin manufacturing process is the forming machine shown above. The output of a few minutes on a single machine will fill a large tray.

The formation of bobby pins on high speed machines calls for wire of uniform quality. The stresses the wire undergoes in assuming its final shape demand high standards.

Heat treating is necessary to relieve the stresses set up in the wire by the severe deformations the wire undergoes in the bobby pin forming machines.

Packaging is precise at Flamingo Products, Inc. Here Mrs. Frances Bradfield demonstrates how a battery of girls box the finished bobby pins.

Consider the bobby pin. It presents a tough manufacturing problem for it weighs only 1/100th of an ounce and costs less than a penny.

Women stick about 10,000 tons of bobby pins into their hair each year, yet the average bobby pin has a very short life before it disappears—where, nobody knows.

You might think that such a small item, which sells for so little and has such a short life expectancy, would be produced in large quantities without much regard for close tolerances or uniformity.

Bobby pin manufacture actually is a very precise, closely controlled operation that requires very high quality steel wire of consistent uniformity. That's where Johnson Steel & Wire Company fits into the picture—supplying leading producers with uniform wire that has the chemical composition and physical properties to meet exact specifications.

The quality of the wire is all important to the economical production of high quality bobby pins. If the wire is too soft, it will lack the springiness and clamping action which a bobby pin must have. If the wire is too hard, it will break in the bobby pin forming machines and cause costly production delays. If it isn't the correct half oval or flat shape, it won't go through the forming machines.

Take a look at how one producer, Flamingo Products, Inc., Danville, Illinois, uses this wire, and you'll appreciate how much is involved.

Heart of the bobby pin manufacturing process is the forming machine, which uncoils wire, coats it with kerosene for lubrication, straightens the wire, cuts it into proper lengths, bends it back on itself to form the characteristic bobby pin shape, crimps one side with five bends and tips one end into a "ski jump" so that the ends of the pin can be separated easily.

With each machine operating at the rate of 250 pins per minute, a battery of pin forming machines can produce around three million pins a day. One machine forms about 95,000 bobby pins out of a 100-pound coil in about six hours.

Heat treating is necessary to relieve the stresses set up in the wire during the forming process. Enameling, or electroplating, gives bobby pins protective coatings, which match the various shades of women's hair. Finally, the tips are given a special dip coating of polyethylene plastic which is baked and cured.

Rigorous testing completes the cycle.

Wire made by Johnson Steel & Wire Company for bobby pin manufacturers is a tailor-made product.

Flamingo, for example, gets a bright finish, hard drawn, high carbon wire, which is rolled to a half oval or flat shape before it is shipped from the mill in fiber drums lined with moisture resistant paper. The wire is .055 inch wide and .022 inch thick. Plus or minus tolerance on width is .002 inch and only .0005 inch on thickness.

Other Johnson products cover a wide range of wire specialties including: Aircraft Cord Wire . . . Armature Binding Wire . . . Belt Hook Wire . . . Brush Wire . . . Gutterbroom Wire . . . Card Wire . . . Shade Roller Wire . . . Flexible Shaft Wire . . . Heddle Wire . . . Hose Reinforcement Wire . . . Hose Wire . . . Mandolin Wire . . . Piano Wire . . . Rope Wire . . . Safety Pin Wire . . . Special Shaped Wire . . . Staple Wire . . . Metal Stitching Wire . . . Signal Corps Wire . . . MB Spring Wire . . . Music Spring Wire . . . Tire Bead Wire.

If you have an application which requires uniform high quality wire made to close tolerances, Johnson is ready to serve you. Why not call your closest district office today?

Johnson Steel & Wire Company, Inc.

Worcester 1, Massachusetts

PLANTS: Worcester • Akron • Los Angeles **WAREHOUSES:** Worcester • Chicago • Los Angeles

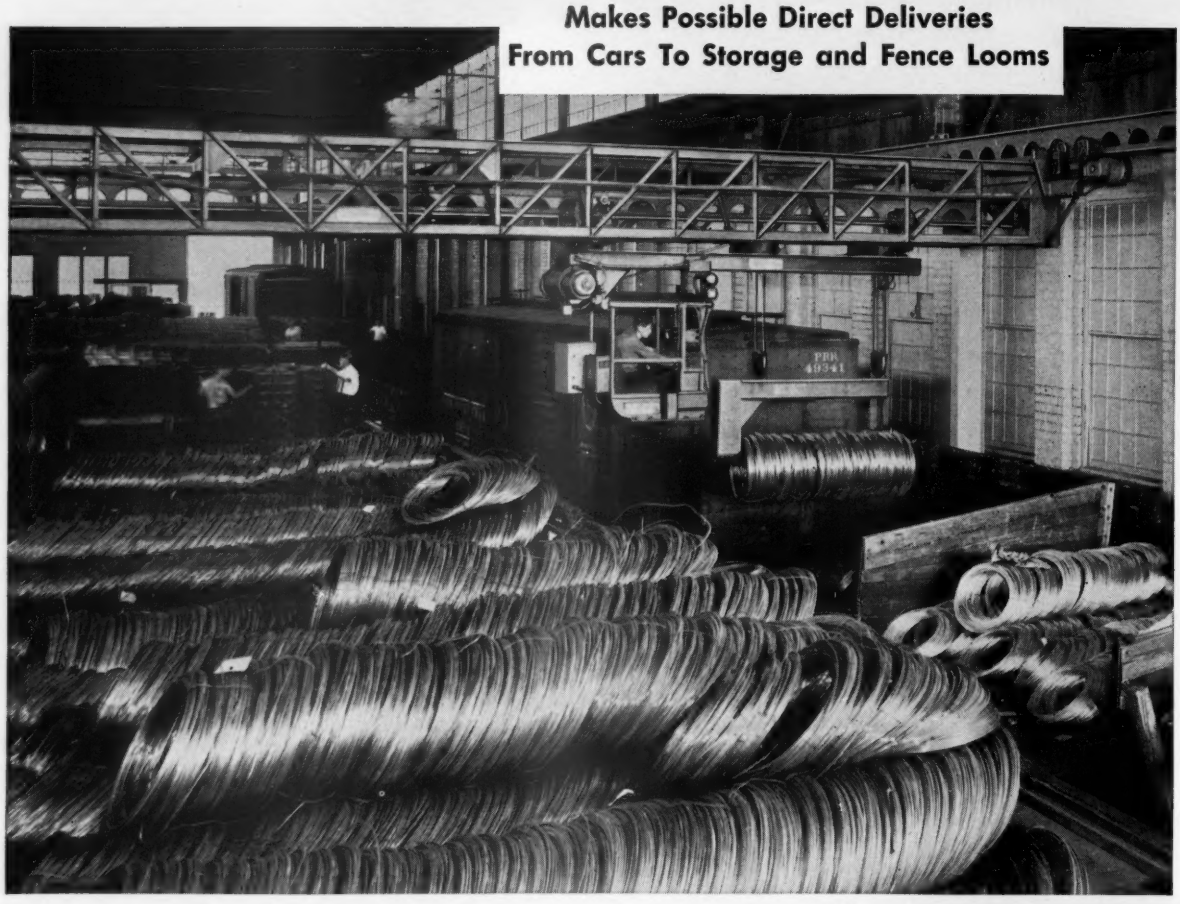
a subsidiary of **Pittsburgh Steel Company**

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES: Akron • Atlanta • Chicago • Cleveland • Columbus Dallas • Dayton • Detroit • Houston • Los Angeles • New York • Philadelphia Pittsburgh • San Francisco • Tulsa • Warren, Ohio. **PLANTS:** Monessen, Pa. • Allenport, Pa. • Akron • Los Angeles • Unionville, Conn. • Warren, Ohio • Worcester, Mass.

Transfer Crane Speeds Wire Handling

Makes Possible Direct Deliveries From Cars To Storage and Fence Looms



3300 lb. loads of wire are picked up from specially arranged flat cars and placed in storage or delivered directly to fence and road-mesh looms located in various parts of a building with a Cleveland Tramrail overhead handling system.

An important part of the system is a 52'-0" span transfer crane which operates over the railroad track and the large storage area for the full length of the building. The crane is designed with double truss girders which give it great rigidity and strength. This construction has the advantage of light weight and permits interlocking with the track system.

Handling costs are extremely low because the operator in the cab carrier, without floor assistants, can move vast tonnages simply by manipulating controllers in his cab. These permit him to lower, raise and thread the hairpin hook into and out of wire coils, operate the crane on its runway and travel the carrier to all points on the entire track and switch system.

Cleveland Tramrail is playing an important role throughout the wire and rod industry. For any problems on handling, cleaning, drawing, or block-stripping, your inquiries are invited.

GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
9221 EAST 288TH STREET WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

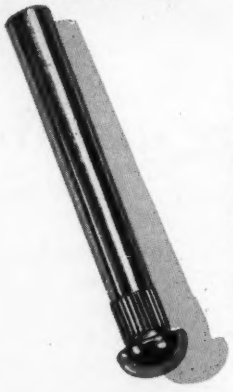
CHECK THE ADVANTAGES OF STAINLESS STEEL FASTENERS

✓ for boosting product quality!

Where appearance and performance call for quality parts, don't overlook the advantages of stainless steel fasteners. Take the illustrated E. W. Ferry fasteners, for example. They're priced right in line with quality fasteners of other materials. Yet they offer all the extra qualities stainless steel brings to any part — high tensile strength . . . attractive, rust-resisting finish . . . and remarkable resistance to heat and corrosion. In almost any application they outlast, many times over, fasteners of nonresistant or plated metal. They cut maintenance costs, too. For even after years of service, disassembling rust-free stainless fasteners is always a fast, easy operation.

✓ for reducing production costs!

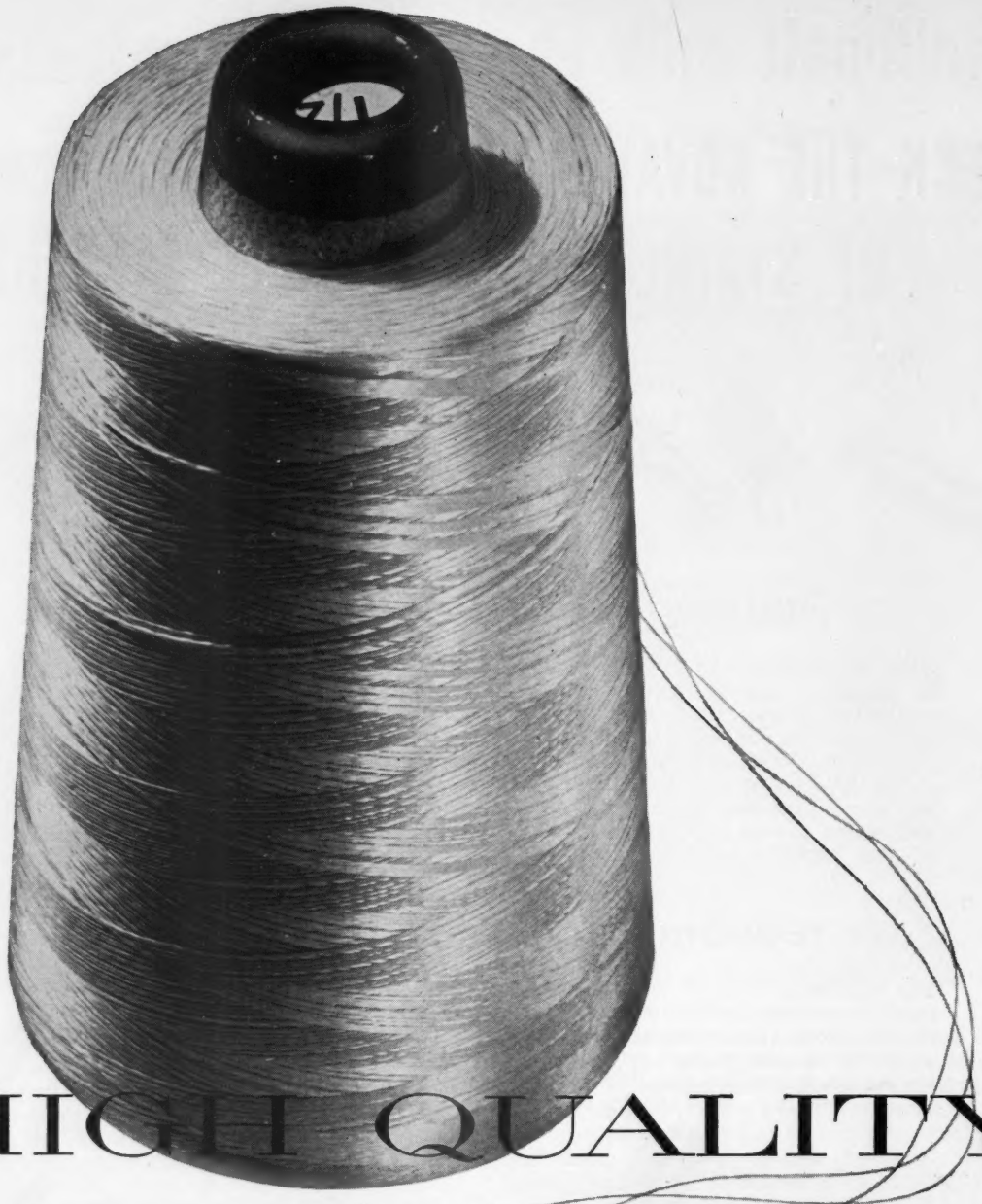
The hardness of stainless steel fasteners results in substantial savings on the assembly line. Work is faster, results are better — simply because stainless screw-heads are less apt to burr and nick. This means major savings, for even a slipping screwdriver can seriously damage both the screw and the parts being assembled. Stainless steel fasteners cut tooling costs, too. For they are now available in practically every size and description.



Crucible now offers stainless fastener wire in all diameters . . . in suitable tempers . . . in a variety of finishes, including bright and several metallic and nonmetallic coatings . . . in all standard grades. For prompt delivery of the stainless steel wire you need — or for your free copy of Crucible's new, 32-page catalog "Rezistal Stainless Steel Wire" — call or write to *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



HIGH QUALITY

fiber glass yarns for wire and cable insulation

Pittsburgh Fiber Glass yarns are made of exceptionally uniform continuous filaments, twisted and plied for any desired buildup. They are packaged for use with all standard types of serving and braiding machinery.

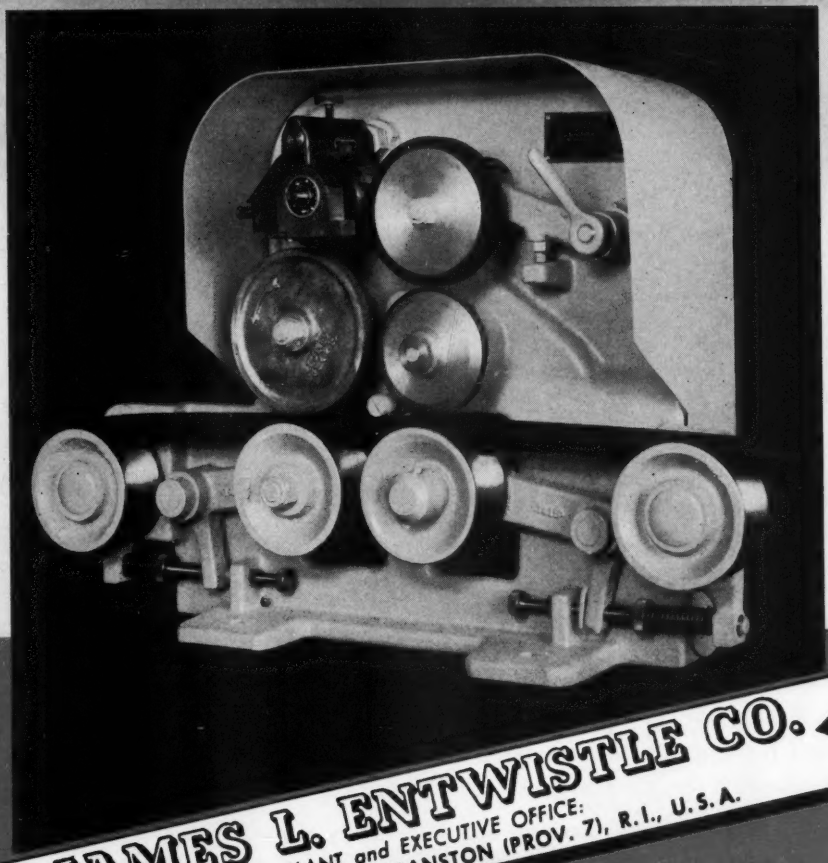
Pittsburgh yarns have proved their high quality with numerous manufacturers. If you have not yet put them to your tests, you are invited to make arrangements through our executive or district sales offices. Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.

FIBER PG GLASS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

DESIGNERS OF WIRE MACHINERY



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USE JLE HIGH PRODUCTION MACHINES FOR SPIRAL MARKING, STRIPING, OR PRINTING ON VIRTUALLY ALL TYPES OF INSULATED WIRE

WIRE MARKING MACHINE, CLASS A

These machines are designed for cold printing or striping on wire 1/16" to 2" diameter at speeds to 1000 ft./minute making use of inexpensive rubber type strips.

Ask for Catalogue 18A

EXTRUDER MARKING MACHINE, TYPE F

An extremely rugged and foolproof machine for hot printing between Extruder and Water Trough, operating at Extruder speeds. Prints or stripes in one color; driven by passage of wire.

Ask for Catalogue 18C

(Illustrated: Marking Machine, Type A-2)

SPIRAL MARKING MACHINE, TYPE G

The "G" Marker will economically stripe up to three different colors simultaneously on virtually all types of insulated wire. Wire speeds to 200 ft./min., capacity 3/64" to 5/16" diameter wire.

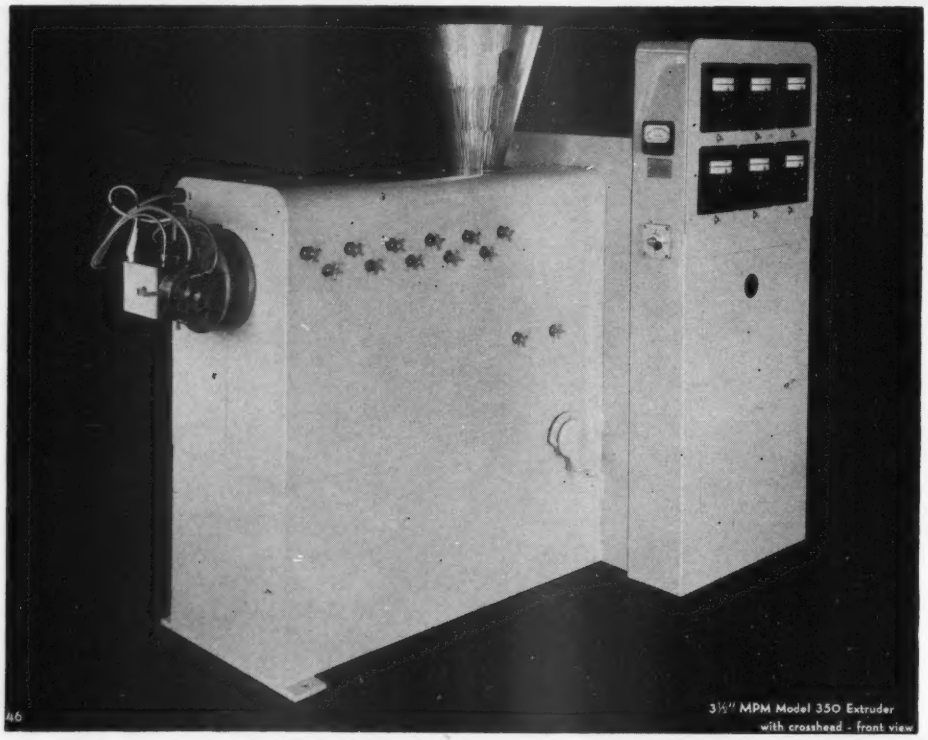
Ask for Catalogue 18D

ALL TYPES OF MARKING OR STRIPING INKS AVAILABLE

Ask for Catalogue 18B

"Modern" INSULATING EQUIPMENT

is designed for those electric wire manufacturers who demand the best in extruders.



mpm

Shown at left: 3½" MPM Model No. 350 Extruder with crosshead, front view.

MPM Extruders are used by nearly all material suppliers, by laboratories for quality testing, and for production. One large electric wire manufacturer now has 17 MPM Extruders-reorders for them indicate the satisfaction they give.

MPM Extruders have the utmost flexibility and will handle a wide range of compounds and cross sections, as they are equipped with the best in temperature controls.

Literature upon request with questionnaire to determine the sizes, types and production requirements. MPM equipment is used in all principal foreign countries, indicating flexibility with many compounds.

Complete line of accessory equipment, such as dual take-ups, capstans, spark testers, measuring units etc.

MODERN PLASTIC MACHINERY CORP.

15 UNION STREET • LODI, NEW JERSEY, U.S.A.

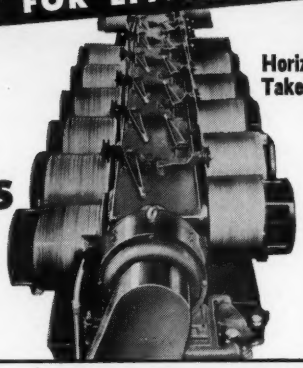
Telephone GRegory 3-6218

Vaughn®

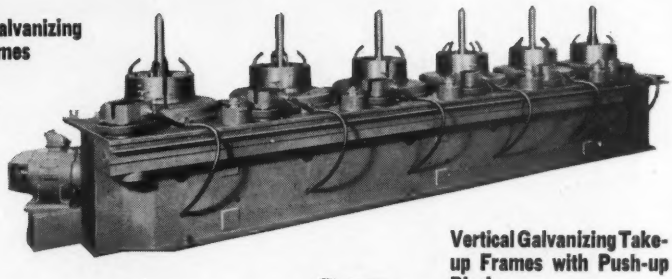
AUXILIARY EQUIPMENT

CORRECTLY DESIGNED—STURDILY BUILT
FOR EFFICIENT WIRE MILL SERVICE

TAKE-UP FRAMES

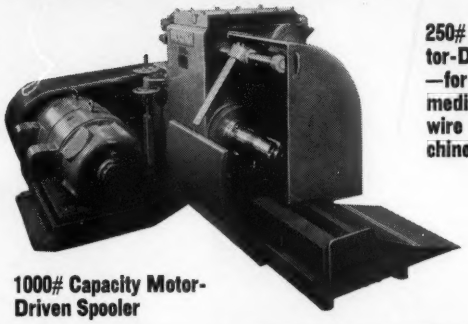


Horizontal Galvanizing Take-up Frames



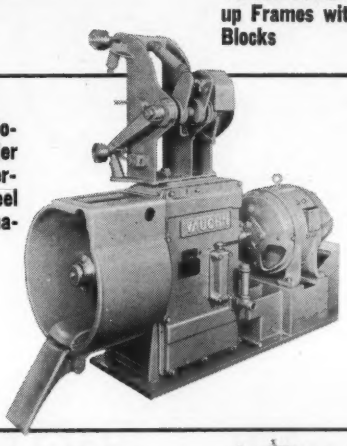
Vertical Galvanizing Take-up Frames with Push-up Blocks

SPOOLERS

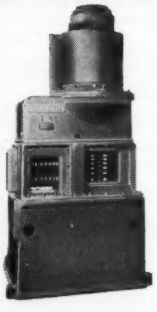


1000# Capacity Motor-Driven Spooler

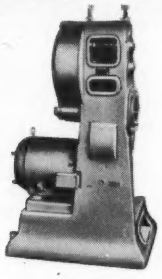
250# Capacity Motor-Driven Spooler —for use with intermediate or fine steel wire drawing machines



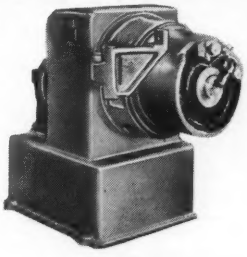
POINTERS and DIE STRINGERS



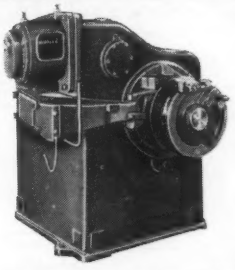
Extra-Heavy Four-Roll Pointer for 1¼" diameter low carbon steel rod



No. 1 Continuous Pointer

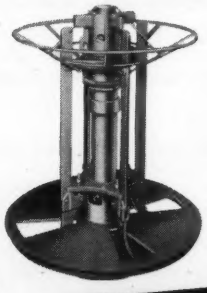


Die Stringer with Pointer

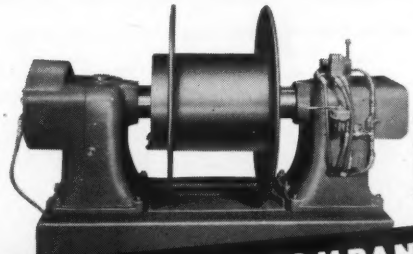


No. 1 Combination Die Stringer & Power Pointer

PAY-OFF MACHINES



Riding Type Block Stripping Spider used with Pallet and Pay-Off Ring as a Pay-Off Reel



4000# Capacity Pay-Off Stand for paying off from large spools

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"Quick on the Draw!"

THE VAUGHN MACHINERY COMPANY

CUYAHOGA FALLS, OHIO, U.S.A.

COMPLETE COLD DRAWING EQUIPMENT Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys

...SWIFT'S SOAPS are the efficient lubricant for wire drawing

IMMEDIATE DELIVERY ON THESE QUALITY SOAPS...

- Powdered White Ribbon
- Guaranteed Powder
- Snap Heavy Duty Wire (Drawing Powder No. 282)
- No. 559 Powdered Soap

Whether it's used for chicken wire or cable, all wire has this in common: speed is profit; and with speed comes heat.

With increased heat, more draws and *less* cooling time between draws, a compromise with the quality of your drawing lubricant is a compromise with the efficiency you purchased in high speed equipment.

Swift's wire drawing lubricants are stable, efficient and dependable *because* they are produced to uncompromising standards of quality... standards established through constant attention to the specific needs of our many and varied customers. Included are an ever increasing number of specific soaps for specialized protection . . . a continually expanding, versatile line of products designed to help you make the *most* of high speeds, the *least* of heat and stress.

That's why your Swift man is a *single source* for resourceful service. 375 distribution points throughout the U. S. and Canada can provide prompt delivery and courteous service. Write for details and remember...

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HUBBARD—SPOOL and REEL HEADQUARTERS

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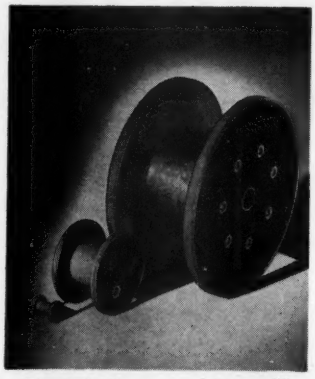
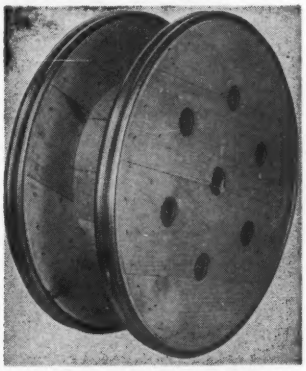
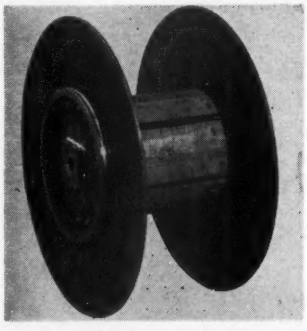


Plywood—Process and Returnable Shipping Reels.

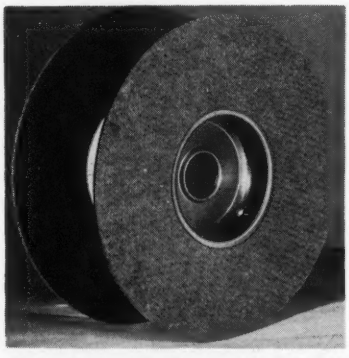
Dimension Lumber for Returnable Reels.



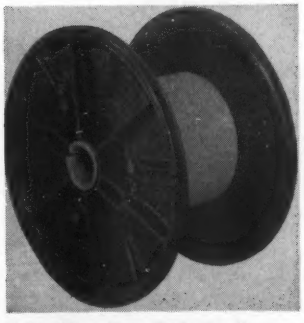
Nailed Reel. Banded for Returnable Types.



Special Reels Made to Your Designs



Reel with masonite flange and cardboard hub assembled with steel end washers for domestic or export shipment of wire, tape, braid or other materials.



Light Alloy Cast Reels for Process & Shipping

The HUBBARD LINE of Spools and Reels includes all types and combinations of constructions for shipping, shop and processing for wire, rope and electric wire and cable, standard or made to your specifications.

We invite your inquiries.

HUBBARD SPOOL COMPANY

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"THE BIGGEST NAME IN SPOOLS AND REELS"

FASTER PRODUCTION? FINER PRODUCTS?

MARVINOL VR-22

GIVES BOTH!

New Marvinol® VR-22 is a straight polyvinyl chloride resin *especially designed for dry blend extrusion* for both electrical and non-electrical applications. Easily calendered or molded, too, VR-22 gives you and your customers these important benefits.

PRODUCTION BENEFITS—better dry blending in all types of heated mixing equipment • uniform, free-flowing mixes • rapid drying time —allows shorter mixing cycles • high extrusion speeds • shorter Banbury cycles • smooth, free-rolling bank for calendered film and sheeting • allows reprocessing of your film scrap material without color change.

PRODUCT BENEFITS—gives product exceptionally high gloss • provides excellent electrical properties • produces gel-free film and sheeting • offers excellent heat, light, and color stability.

Marvinol VR-22 has already been used to advantage in... tough, glossy garden hose...efficient, attractive wire insulation... smooth, tough pipe and tubing...strong shoe welting and upholstery binding...heavy gauge press polished sheet.

Why not profit with Marvinol VR-22 for...

- window channels and panel trim?
- tough upholstery?
- primary insulation and cable jackets?
- window shades?
- electrical tape?

Why not investigate new Marvinol VR-22? And think of it in terms of the *easier production* and *extra sell* it can give *your* products. Find out more about this important new vinyl resin by writing on your letterhead to the address below.

Naugatuck Chemical

Division of United States Rubber Company

Naugatuck, Connecticut

US RUBBER

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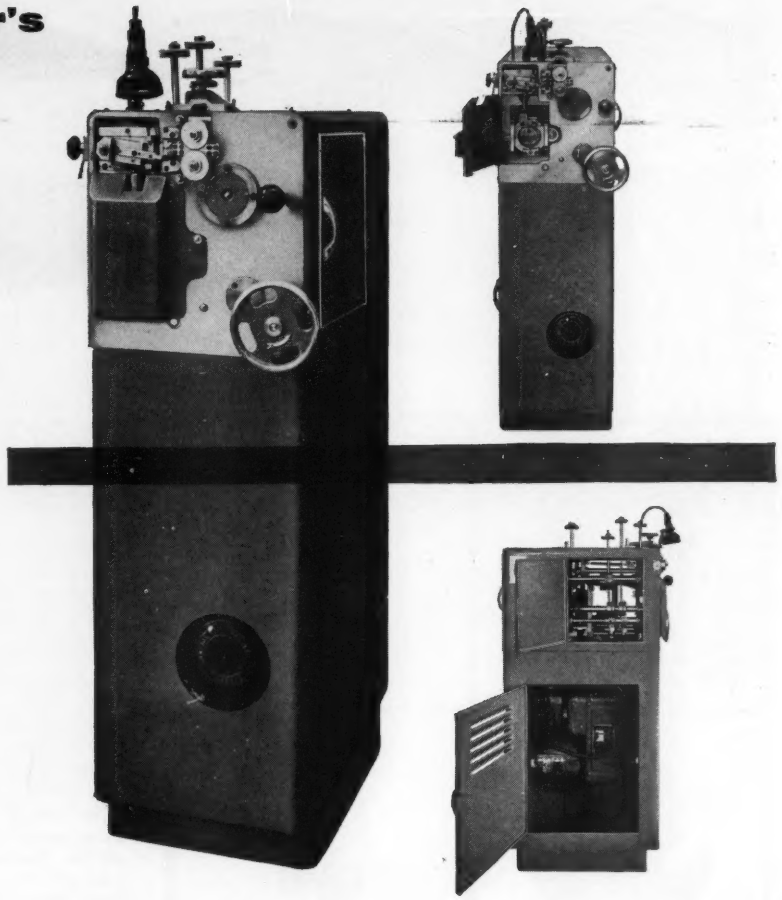
Naugatuck Chemical is an original sponsor of the new Vinyl Film Standard of Quality Program.

Springmaker's Delight!

.... Torrington's new W-10A

Based on the famous W-10 Spring Machine which has long been standard equipment throughout the industry, Torrington now offers the modernized W-10A Springmaker. This versatile, high-production machine includes many new features, all of which contribute to ease of set-up, correct location of controls, "clean" design and lower maintenance.

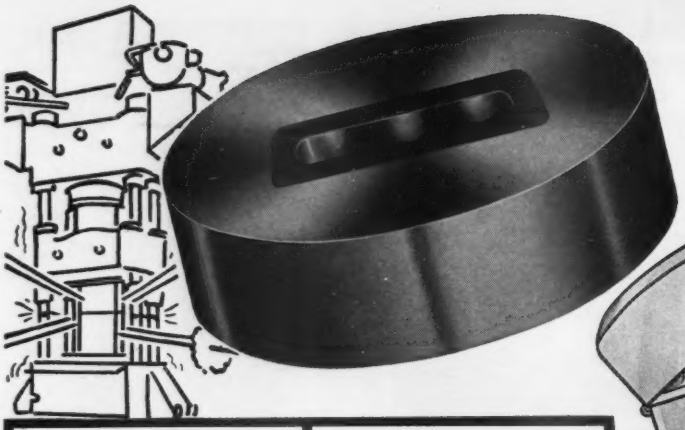
Read the specifications. Then call or write for further information on how the W-10A can be put to work in your plant to speed your production and reduce your costs.



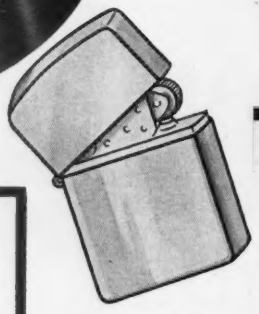
SPECIFICATIONS

Wire Diameter Range	.008" to .028"
Wire Length Per Spring	0" to 24"
Coil Range (O.D.)	$\frac{1}{16}$" to $\frac{7}{8}$"
Production	24 to 243 with motorized variable speed transmission 21 to 240 with electronic adjustable speed drive
Drives	½ HP motorized variable speed transmission ¾ HP electronic adjustable speed drive
Extra Wire Feed Gears	0" to 36" of .008 to .024 diameter wire 0" to 48" of .008 to .020 diameter wire
Special Wire Feeds	0" to 6½" (using standard wire feed gears reversed)
Attachments Available	Torsion spring coiling mechanism, double diameter spring control mechanism, continuous coiling, 10 roll—2 plane-quick-opening ball bearing straightener, 5 roll—single plane—quick opening ball bearing straightener
Floor Space	21" front x 28" deep
Wire Line Height	48"
Weight	695 lbs.

THE
TORRINGTON
MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT



12,979,660 LIGHTER CASES WITH TALIDE DIES

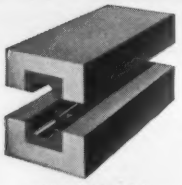


A leading producer of cigarette lighter cases was experiencing considerable trouble using steel dies. An excessive number of lighter cases were being scrapped due to tears and deformation. Die cost was running $.028 per lighter. Operation involves drawing .020" thick carbon steel on A-3 Niagara presses, 45 strokes per minute.

Our die engineers were called in, and after installing specially designed Talide dies on customer's press line, rejects were eliminated, as well as time previously spent in buffing and polishing the cases after drawing. Subsequent plating expense was reduced ⅓ due to the smoother surface on the cases drawn.

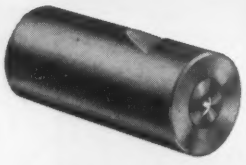
The original 15 Talide dies placed in production have now drawn a total of 12,979,660 cases for an average life of 865,310 per die. Previous steel dies produced an average of 15,000 cases per die. Die life was therefore increased 58-1 after the installation of Talide dies.

Die cost has now been reduced to $.0008 per lighter drawn, and customer estimates his saving for the past year, using Talide dies, has been at least $25,000.



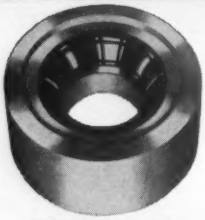
SWAGING DIES

Leading Fountain Pen Manufacturer cold swages 33 times more stainless steel parts with TALIDE dies.



HEADING AND EXTRUSION DIES

Cold-heading ¾" carriage bolts, TALIDE dies produced 1,500,000 pieces, steel dies only 50,000.

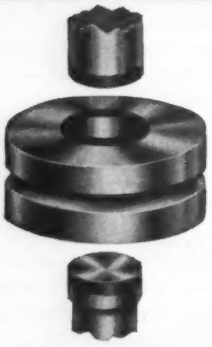


SHEET METAL DIES

137,000 hi-alloy steel Pressure Vessels drawn with TALIDE, against only 7,900 with steel dies previously used.

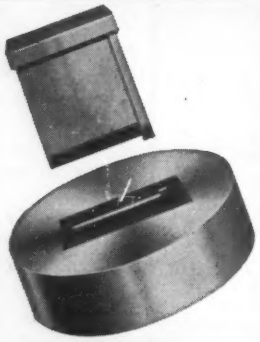
CURLING ROLLERS

TALIDE Curling Rolls last 65 times longer than steel rolls on beverage can forming operation.



POWDERED METALLURGY DIES

Pill dies of TALIDE metal outlast steel dies 100 to 1 while reducing rejects 82%.



BLANKING AND FORMING DIES

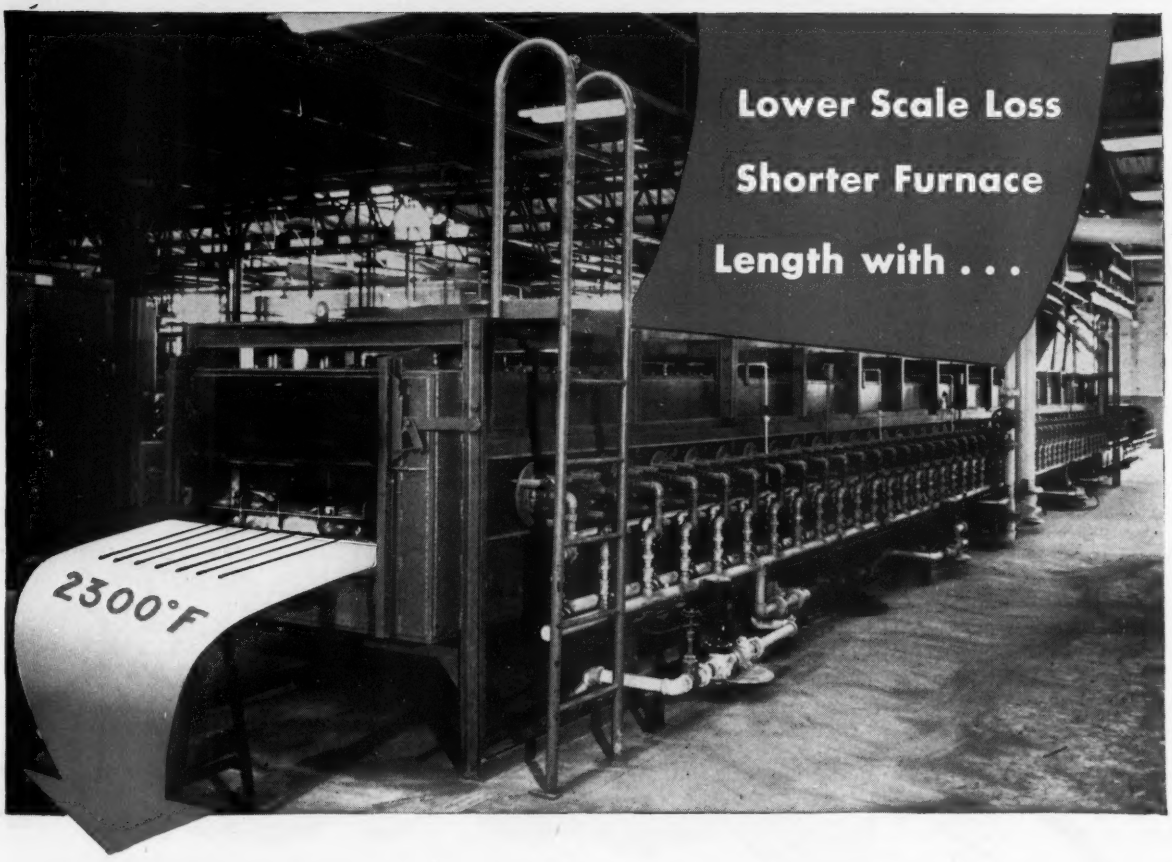
70 times more paper discs blanked out with TALIDE—over hard alloy die.

IMPROVED QUALITY

Additional refinements and improvements in our process have added still longer life to the wearing edges of Talide tools, dies and wear-resistant parts. The result is a carbide having a new, unique grain structure with harder and tougher properties than previous grades. Laboratory tests reveal our improved grades possess 25% greater strength and rigidity. Service life per grind up to 50% longer than previous grades has been proven in grueling field tests.

"Year after year—you can rely on TALIDE METAL for uniform results and consistent quality."
METAL CARBIDES CORPORATION
MC
TALIDE®
YOUNGSTOWN 7, OHIO
HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

Send for new 84-page Catalog 55-G or ask for sales engineer to call.



GASMACO wire patenting furnaces

GASMACO Wire Patenting Furnaces substantially reduce maintenance and operating costs and keep production at a steady pace. Elevated furnace temperatures heat faster; permit shorter furnace design and thus offer floor space bonuses.

Necessity of alloy muffle tubes eliminated. Indirect-fired GASMACO Patented Silicon Carbide Radiant Tubes virtually eliminate "down time," and supply high thermal head with atmosphere control over scale.

For a complete description of a GASMACO Wire Patenting Furnace at work, write for your copy of Bulletin A-105.

REPRESENTATIVES IN:

BIRMINGHAM • BOSTON • CHICAGO • ST. LOUIS • LOS ANGELES • SEATTLE • SAN FRANCISCO

THE GAS MACHINERY COMPANY
16110 WATERLOO ROAD
CLEVELAND 10, OHIO

Designers • Fabricators • Erectors
Gas Plant Equipment and Industrial Furnaces
THE GAS MACHINERY CO. (Canada) Ltd.
HAMILTON, ONTARIO

DURPON*

WIRE-DRAWING COMPOUNDS

last twice as long... yet cost no more!

We realize we're claiming a lot for Nopco Durpons. Perhaps the only men who believe it are the men who use Durpons. But they are the ones that matter.

There are two sound reasons for Durpon's profitable performance: All Durpon compounds contain: (1) a buffer, to maintain the pH level, keep the emulsion from breaking; (2) a sequestering agent, which holds the metal particles away from the effective drawing ingredients, *keeps the bath clean.*

Won't you be the next to try these high-performance compounds, and learn first-hand the economies they bring? Write today for technical bulletin and free working sample.

Nopco Chemical Co.,
336 Industrial St., Harrison, N. J.

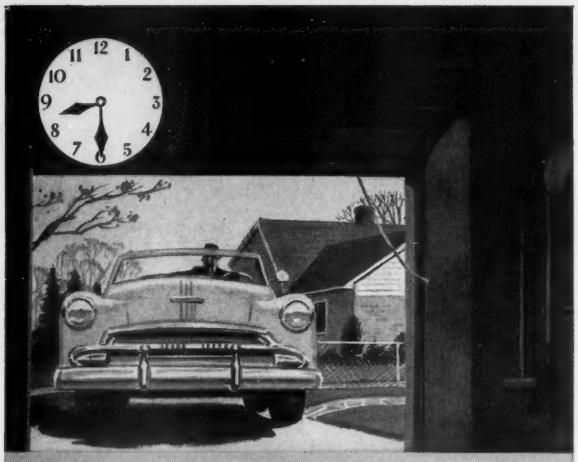
"Stay Stable Longer"

DURPON—for intermediate gauge wire
DURPON L—for heavy wire, rods, and tubes
DURPON FW—for fine wire

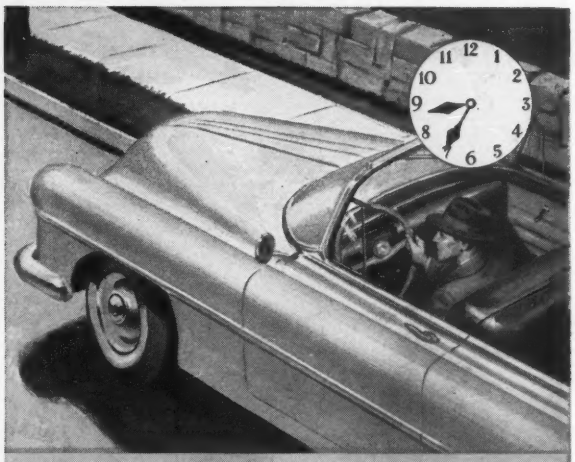
NOPCO

*Reg. U.S. Pat. Off.

PLANTS: Harrison, N. J. • Cedartown, Ga. • Richmond, Calif.



8:30 A.M.—GARAGE. A lucky fellow, John rides to work every day in his car. This is his garage. Notice that it has a smooth-operating overhead door. What makes it swing up? A large spring. And—you guessed it—it's made from CF&I-Wickwire Wire.



8:35 A.M.—AUTOMOBILE. CF&I-Wickwire Wire contributes much to the comfort and efficiency John gets from his car. There's wire in the springs of the seat and back cushions. Also under the hood in the valve springs and the starter spring.

ROUND THE CLOCK *with*

CF&I-WICKWIRE WIRE

8:45 A.M.—HIGHWAY. Notice the ribbon of concrete over which John's car rides smoothly to its destination. Many people, just like John, fail to realize that what holds it together is Welded Wire Reinforcement Fabric—another of the products that use CF&I-Wickwire Wire.

FOR THE WIRE YOU REQUIRE CHECK CF&I-WICKWIRE

Watch for the balance of John's day in succeeding advertisements that take him to his office, through his plant and finally home to his living room.

CF&I-WICKWIRE WIRE

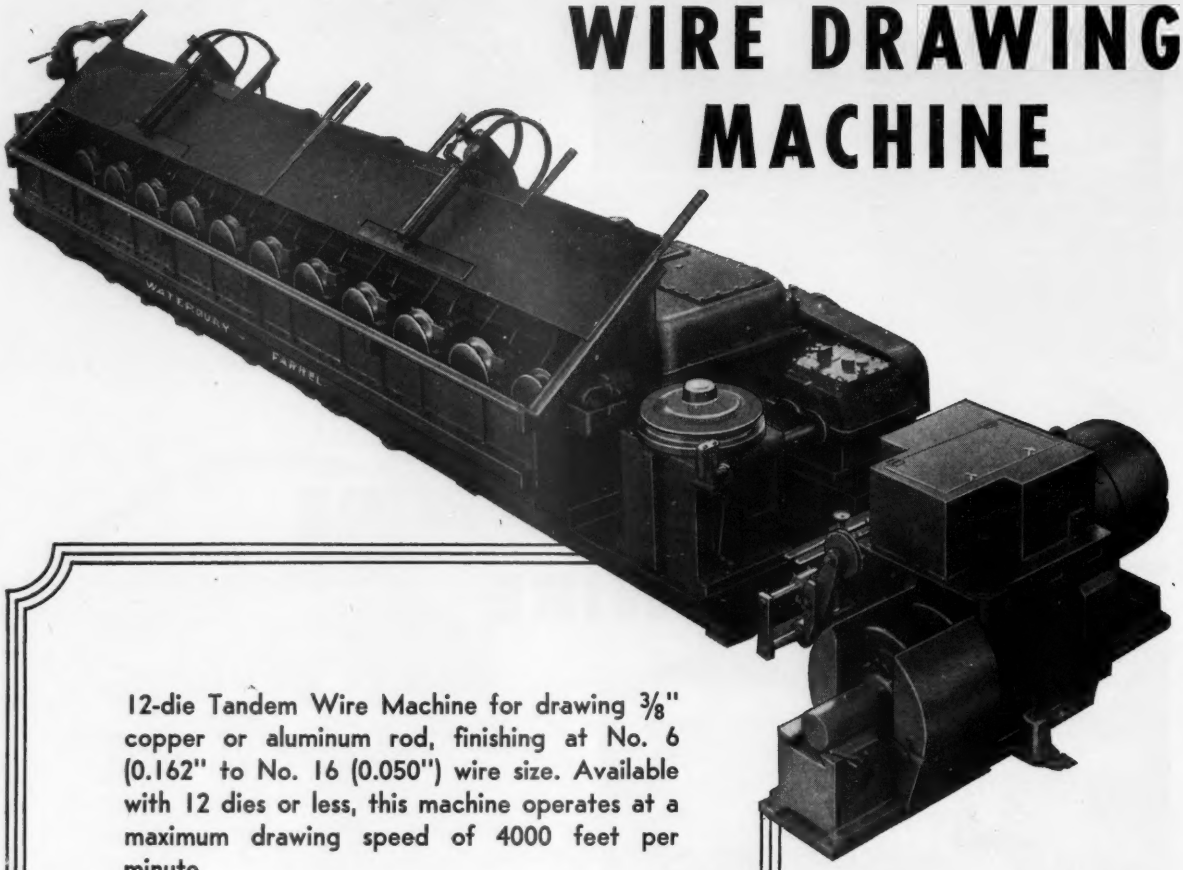
THE COLORADO FUEL AND IRON CORPORATION

WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia

2847 THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso • Ft. Worth • Houston Lincoln (Neb.) • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • Seattle • Spokane • Wichita

4000 FEET PER MINUTE

WITH THIS WATERBURY-FARREL 12-DIE TANDEM WIRE DRAWING MACHINE



12-die Tandem Wire Machine for drawing 3/8" copper or aluminum rod, finishing at No. 6 (0.162" to No. 16 (0.050") wire size. Available with 12 dies or less, this machine operates at a maximum drawing speed of 4000 feet per minute.

It can be furnished for drawing on spools, or coils, or as a combination machine for both as shown.

IF IT'S MILL EQUIPMENT... *WE HAVE IT!*

WATERBURY FARREL FOUNDRY & MACHINE CO. • WATERBURY, CONN.

Offices: Chicago, Cleveland and Millburn, N. J.

WIRE MILL EQUIPMENT—Continuous Wire Drawing Machines (Upright Cone and Tandem) • Wire Flattening Mills • Chain Draw Benches • Pointers • Swagers • Bull Blocks • String-up Machines • Spoolers, etc. *COLD PROCESS BOLT & NUT MACHINERY*—Headers (all types) • Rivet Machinery • Trimmers • Thread Rolling Machines • Slotters • Nut Formers and Tappers, etc. *POWER PRESSES*—Crank, Cam and Toggle; also Rack and Pinion Presses • Eyelet Machines • Multiple Plunger Presses • Horizontal and Hydraulic Presses, etc. *MILL MACHINERY*—Rolling Mills: Strip, Rod, Wire Flattening, (For Ferrous and Non Ferrous Metals) • Also Slitters • Straighteners • Cut-off Saws • Coilers • Winders, etc.

FOUNDED WATERBURY FARREL 1851

It's outstanding!

EVERY MANUFACTURER who tries Roebling high carbon flat spring steel discovers the same thing... that this spring steel is absolutely unexcelled for dimensional and mechanical uniformity... for speeding production and cutting down rejects.

You always *pay* for the best when you buy flat spring steel... make sure you *get* it by specifying Roebling. John A. Roebling's Sons Corporation, Trenton 2, N. J.

Empire State Building, world's tallest building.

ROEBLING CF&I

A subsidiary of The Colorado Fuel and Iron Corporation

BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

NEW DAVIS-STANDARD EXTRUDER...
Gives Improved Temperature Control

NEW THERMA-FIN* UNIT...

PLUS: CONTROLLED-FLOW AIR COOLING...

MEANS FASTER WARM UP...

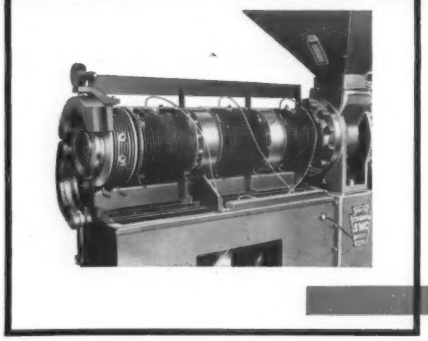
PLUS STEADIER CONTROL...

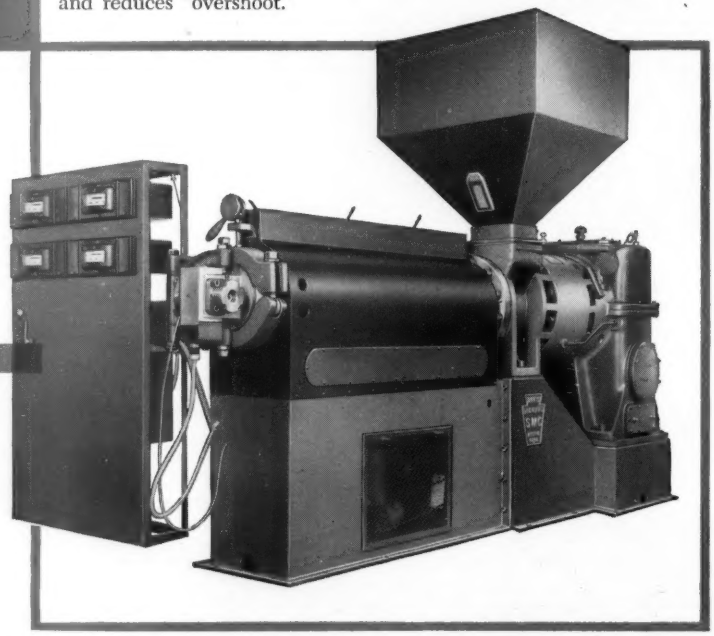
A new half-section Therma-Fin unit has been added at the breaker-plate end of the Model 600T (6" bore) Thermoplastic Extruder. Heat can now be added to or withdrawn from the cylinder over its entire length, from feed throat to breaker plate. The fins on the Therma-Fin units are deeper for more efficient heat transfer.

An electric motor and blower have been installed in a base unit below the extruder cylinder. The Therma-Fin enclosure is divided into three sections along the cylinder, which correspond to the three heat-control zones. In each section, a hand-operated damper provides positive control over the air flow in that section. To minimize heat transfer through the enclosure, it is dual-walled and filled with fiber glass insulation. The inside surface of the stainless steel inner wall is polished to reflect heat inward.

When starting up the extruder, rapid heating is desired to attain running temperature quickly. With the Therma-Fin electrical heating elements on, all dampers shut, the blower off, and the radiant heat from the cylinder being reflected back to the cylinder, very rapid warm-up occurs.

After warm-up, when running at control temperature, the blowers run continuously and the three thermocouples control intermittent addition of heat to maintain exactly the desired temperature. This method of removing heat continuously by the air stream and adding it intermittently by the electrical heating elements provides a sensitive system that reacts more quickly to variations from control temperature and reduces "overshoot."



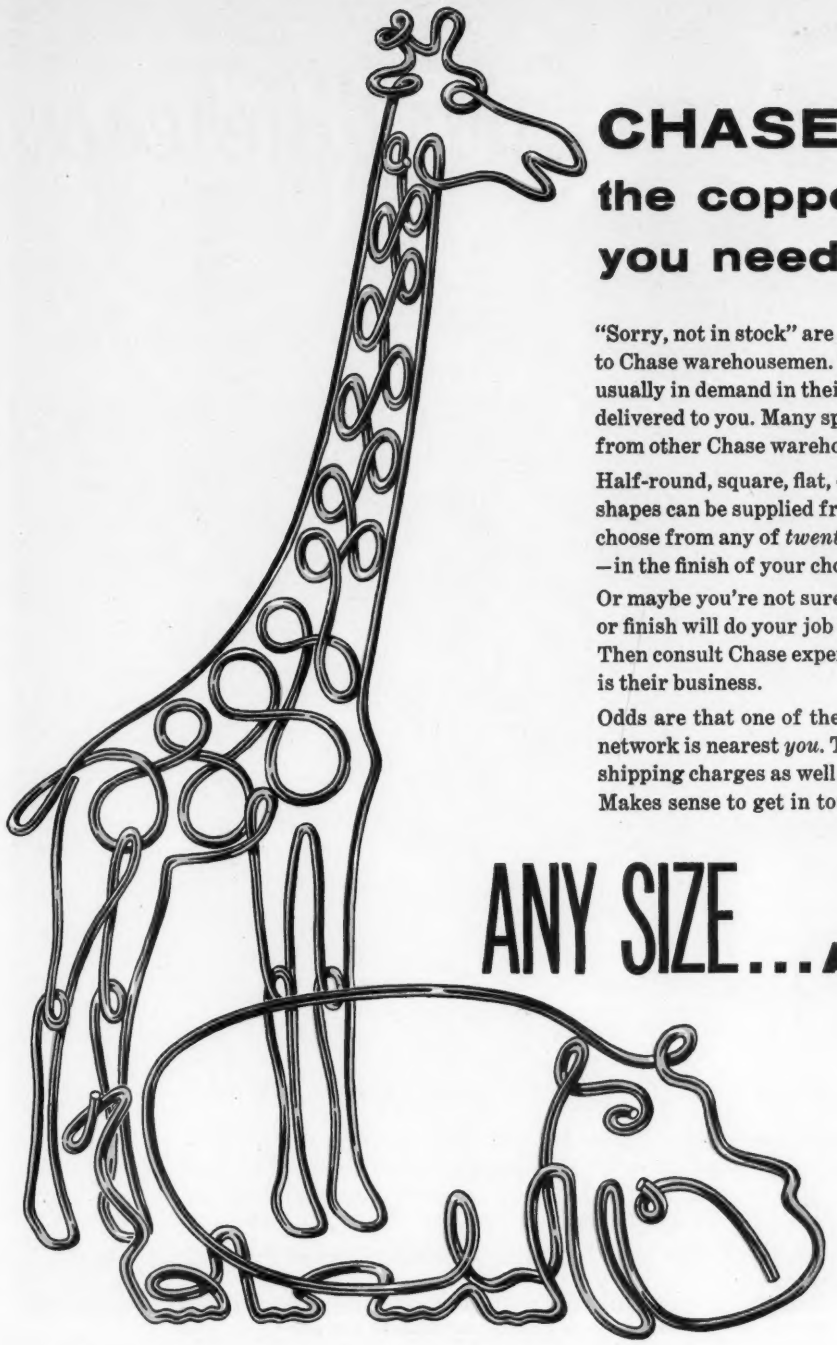


***Patent pending.** *These finned, cast aluminum heater-cooler units have been proving themselves on Davis-Standard extruders since 1949. The cast-in, range-type heating elements have been retained. Cooling by cast-in water tubes has been replaced by the new blower arrangement.*

For more information on the new Model 600T Extruder, write to:

DAVIS-STANDARD
SALES CORPORATION
18 WATER STREET, MYSTIC, CONNECTICUT

SOLE SELLING AGENTS FOR... THE STANDARD MACHINERY COMPANY, World's Largest Manufacturers of Custom-Built Extruding Machines
IN EUROPE AND THE STERLING AREA, CONTACT FINNEY PRESSES LTD., BIRMINGHAM, ENGLAND



CHASE® can supply the copper alloy wire you need

"Sorry, not in stock" are almost unheard of words to Chase warehousemen. They have stocks of the alloys usually in demand in their area—ready to be quickly delivered to you. Many specials can be obtained for you from other Chase warehouses.

Half-round, square, flat, oval, as well as irregular shapes can be supplied from the Chase mills. You can choose from any of *twenty-three* different copper alloys —in the finish of your choice.

Or maybe you're not sure *which* shape or alloy or temper or finish will do your job best and at lowest cost. Then consult Chase experts. Helping you solve problems is their business.

Odds are that one of the warehouses in the huge Chase network is nearest *you*. That means savings on shipping charges as well as faster delivery. Makes sense to get in touch with Chase today!

ANY SIZE...ANY SHAPE

- ROUND
- HALF-ROUND
- SQUARE
- FLAT
- OVAL

AND OTHERS

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

CALL CHASE FOR STAINLESS STEEL TOO!

NEW! Chase's informative wire and rod movie: "IN THE CHIPS." Arrange for a free loan of this film by contacting the Chase warehouse or sales office near you. Write on your company letterhead, today!

The Nation's Headquarters for Brass & Copper

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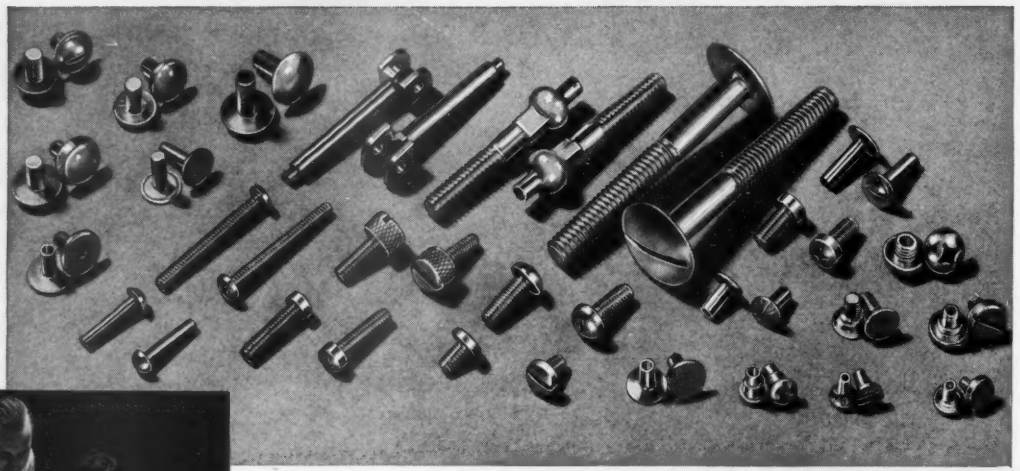
Atlanta	Cincinnati	Grand Rapids†	Milwaukee	Philadelphia	San Francisco
Baltimore	Cleveland	Houston	Minneapolis	Pittsburgh	Seattle
Boston	Dallas	Indianapolis	Newark	Providence	Waterbury
Charlotte†	Denver	Kansas City, Mo.	New Orleans	Rochester†	(†sales office only)

You can sell the difference



SCOVILL EXTRUDED COLD-HEADING WIRE (Cartridge Brass, 70%)

. . . because of its higher copper content and production by the Hot Extrusion process from uniformly sound Continuous-Cast billets . . . virtually eliminates defects (when attributed to wire) such as split heads or shanks . . . "out of round" heads . . . inadequate filling out of heads and shoulders . . . and rough "orange peel" effect. These are differences in quality you can SELL in your cold-headed products.

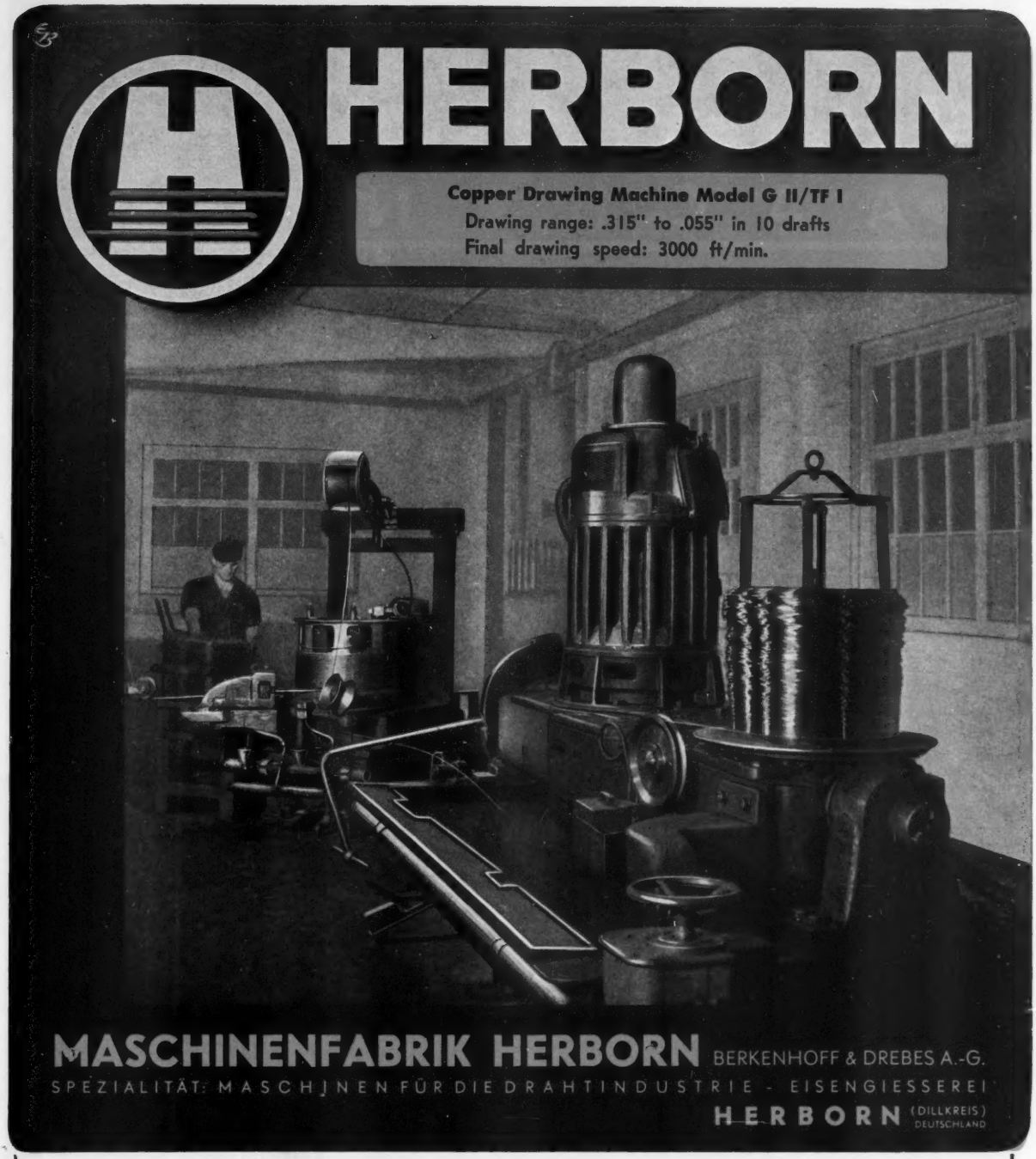
Let us help you specify the proper closely controlled Scovill temper to produce more nearly perfect headed parts . . . whether you require "flow" characteristics for heading, or "flow" plus essential rigidity for secondary machining.

Scovill Manufacturing Company, Mill Products Division,
99 Mill Street, Waterbury 20, Connecticut. Phone Plaza 4-1171.

SCOVILL MILL PRODUCTS

BRASS • BRONZE • NICKEL SILVER • ALUMINUM

165C55


HERBORN
Copper Drawing Machine Model G II/TF I
Drawing range: .315" to .055" in 10 drafts
Final drawing speed: 3000 ft/min.
MASCHINENFABRIK HERBORN BERKENHOFF & DREBES A.-G.
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SCHUMAG AACHEN

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THE FOUR-IN-ONE CONTINUOUS BAR and ROD MAKING MACHINES

FROM A ROUGH COIL OF WIRE

TO STRAIGHTENED AND POLISHED BARS or RODS

BARS or RODS
Round, Square,
Hexagon, Rectangular,
Special Shapes
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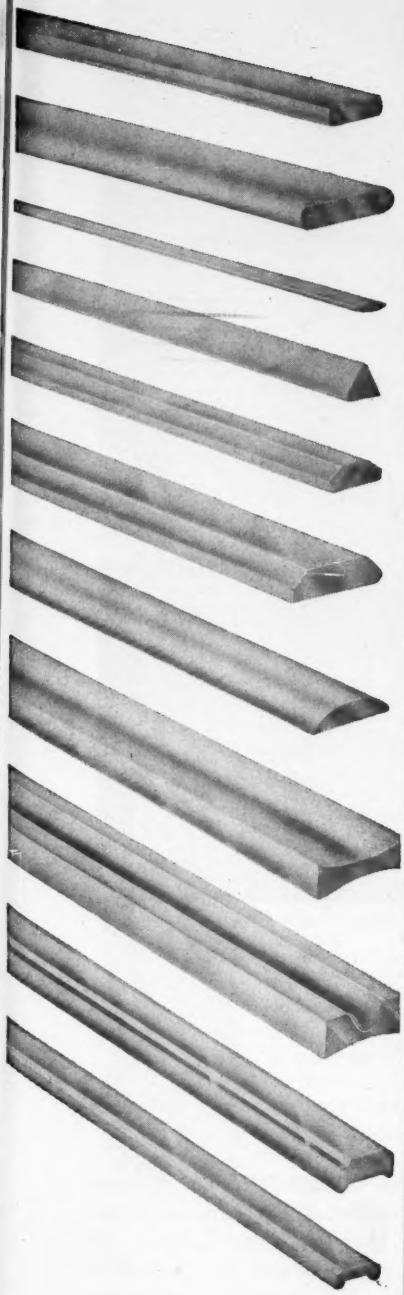
Hundreds of "SCHUMAG" Continuous Bar or Rod Making Machines are today in most satisfactory operation in all industrial countries

Exclusive Representatives for USA, Canada & Mexico
AMERICAN LAUBSCHER CORPORATION
Fisk Bldg., 250 West 57th Street, New York 19, N. Y.



NATIONAL WIRE

(COLD ROLLED)

in Coils or Straight Lengths

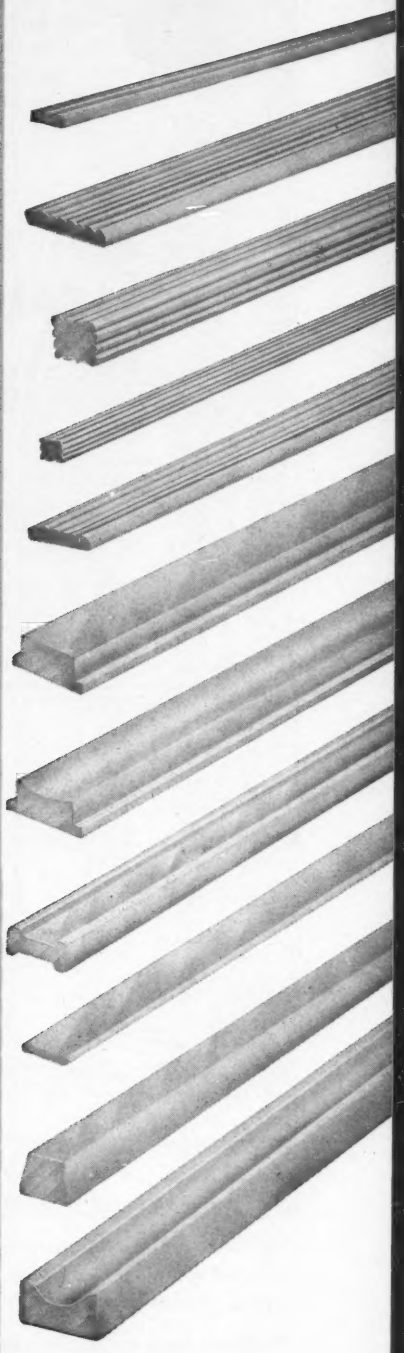
COMPLETE METALLURGICAL SERVICE

Manufacturers of

SPRING WASHERS	RETAINING RINGS
ROUND EDGE FLAT WIRE	KEYSTONE SHAPED WIRE
SQUARE EDGE FLAT WIRE	SPECIAL SHAPED WIRE

Shaped Wire in Coils or Straight Lengths, Ferrous or Non-Ferrous.

LARGE OR SMALL QUANTITIES



Manufactured by

THE NATIONAL LOCK WASHER COMPANY

PRECISION SHAPED WIRE DIVISION

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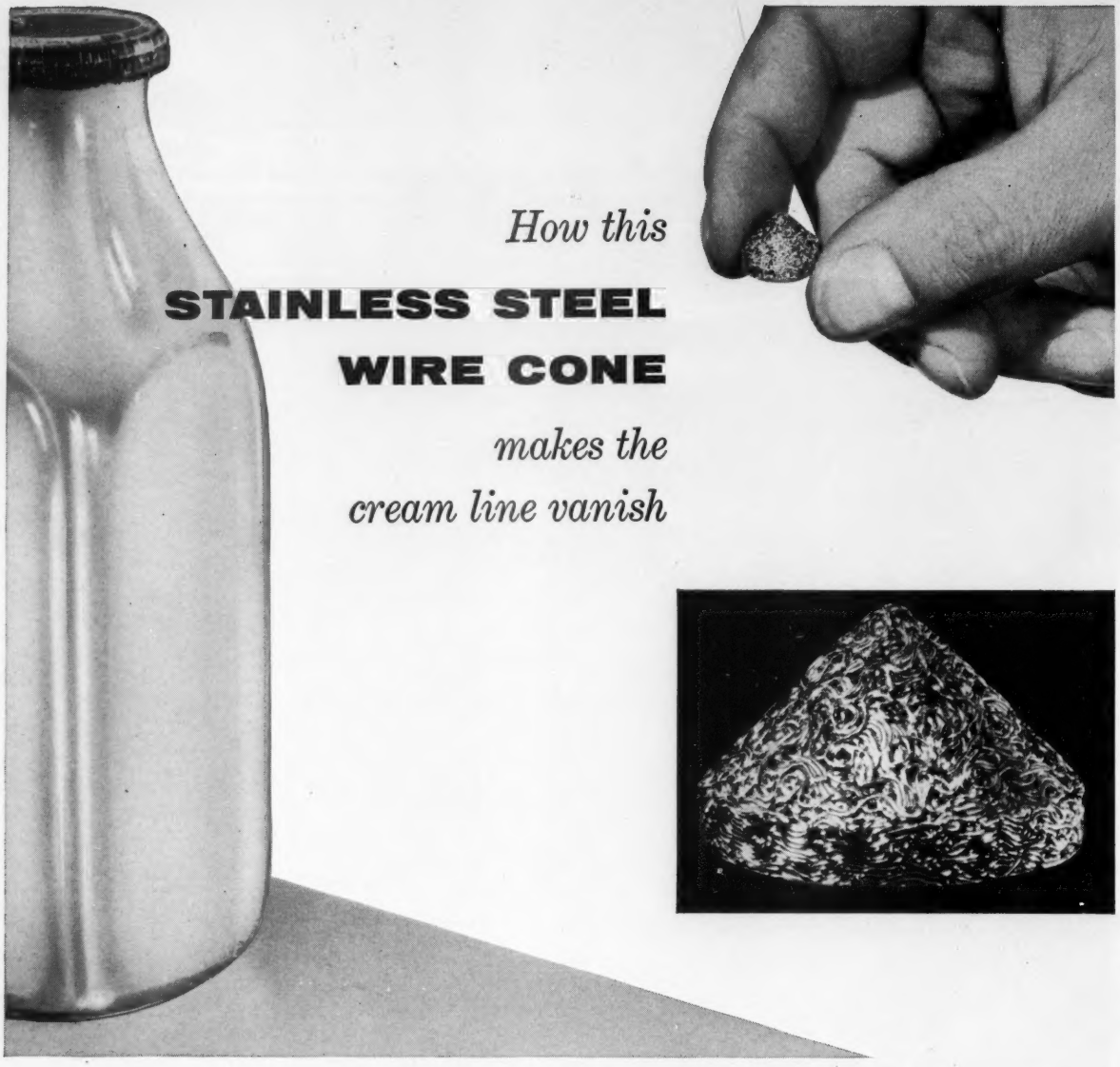

How this

STAINLESS STEEL WIRE CONE

makes the cream line vanish

● All of the cream that used to rise to the top of a bottle of milk is still there. But now you can't see it. Homogenizing has permanently blended the cream into the milk.

The heart of a homogenizer is a porous cone formed of crimped stainless steel wire through which the milk is forced at high pressure.

Ordinary wire couldn't take the combination of tight crimping and severe forming without fracturing. And it was too unstable to avoid matting and distortion under the processing pressure.

National-Standard research teams solved each of these problems so that the dairy industry could have better homogenizing equipment. And we stand ready at all times to work on any problem that will give *you* better and more versatile products made from wire, wire cloth or steel strip. Call us and see.

NS NATIONAL-STANDARD Company NILES, MICHIGAN

NATIONAL-STANDARD COMPANY • NILES, MICHIGAN
Tire Wire, Stainless, Fabricated Braids and Tape
ATHENIA STEEL DIVISION • CLIFTON, N. J.
Flat, High Carbon, Cold Rolled Spring Steel
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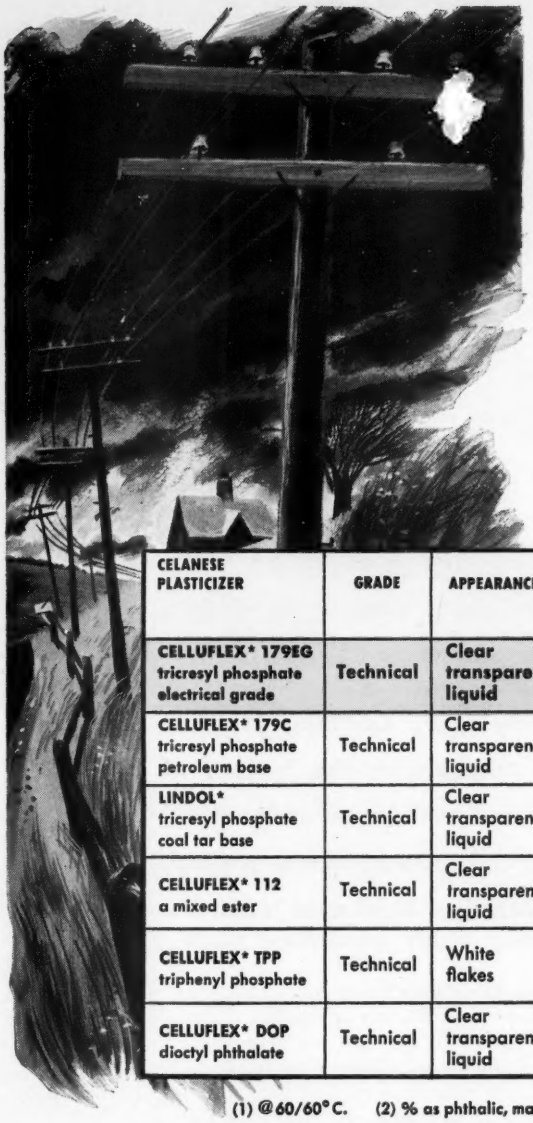
Special Machinery for Metal Decorating
WORCESTER WIRE WORKS DIVISION • WORCESTER, MASS.
Round and Shaped Steel Wire, Small Sizes

Celanese® CHEMICALS

PLASTICIZER



RECOMMENDED

CELLUFLEX* 179 EG

FOR

WIRE INSULATION

WHY

WEATHER RESISTANCE

DESCRIPTIVE DATA

CELANESE PLASTICIZER	GRADE	APPEARANCE	COLOR APHA Max.	SPECIFIC GRAVITY @ 20/20° C.	ACIDITY	ESTER VALUE % Min.	PERMANGANATE TIME, Min. (In Minutes)	REFRACTIVE INDEX @ $n\frac{20°\,C.}{D}$
CELLUFLEX* 179EG tricresyl phosphate electrical grade	Technical	Clear transparent liquid	150	1.145 ± .005	0.01 (3)	99	30	1.552 (5)
CELLUFLEX* 179C tricresyl phosphate petroleum base	Technical	Clear transparent liquid	150	1.165 ± .005	0.01 (3)	99	30	1.553 (5)
LINDOL* tricresyl phosphate coal tar base	Technical	Clear transparent liquid	75	1.165 ± .005	0.01 (3)	99	30	1.556
CELLUFLEX* 112 a mixed ester	Technical	Clear transparent liquid	40	1.210 ± .005	0.01 (3)	99	30	1.560 (5)
CELLUFLEX* TPP triphenyl phosphate	Technical	White flakes	20 (4)	1.221 (1)	0.003 (3)	99	30	1.550 (6)
CELLUFLEX* DOP dioctyl phthalate	Technical	Clear transparent liquid	50	0.985 ± .002	0.01 (2)	98	—	1.4859

(1) @ 60/60° C. (2) % as phthalic, max. (3) % as phosphoric, max. (4) Molten (5) @ $n\frac{25°\,C.}{D}$ (6) @ $n\frac{60°\,C.}{D}$

Where weather and high volume resistivity are major considerations, Celluflex 179 EG is the specified plasticizer. 179 EG (electrical grade tricresyl phosphate) imparts excellent resistance to weathering and maintains high insulation value in vinyl wire and cable coverings.

Celanese is an expanding source of plasticizers for many jobs. Bulk stocks at convenient distribution points are ready to meet tight schedules. Combination shipments — Celanese Plasticizers and Solvents or Intermediates — yield an extra dividend in price differential and freight savings. Be on our mailing list for new plasticizer developments. Please drop a card to Dept. 590-F, Celanese Corporation of America, Chemical Division, 180 Madison Avenue, New York 16, N.Y.

*Reg. U. S. Pat. Off.

Celanese® CHEMICALS

INDISPENSABLE!

The 1955 Edition of the WIRE and WIRE PRODUCTS BUYERS' GUIDE and YEAR BOOK Of the WIRE ASSOCIATION

Thousands of changes in the listings of machinery, equipment, supplies, rods, wire and wire products. The only directory of everything of interest to wire men, this book is an indispensable reference with which to locate sources of supply when you are in the market to buy something.

The Year Book section is completely new. Contains the current directors and officers of the Association, the history of Association activities in 1954, a list of members as of February 1st, the By-Laws of the Association and lists of Medal Award, Certificate of Honorable Mention, Mordica Memorial lecturers.

Price: $5.00 per copy

Subscribers to WIRE AND WIRE PRODUCTS receive a discount of 40%. Members of THE WIRE ASSOCIATION receive a copy without additional cost.

Keep up-to-date. Order your copy today from

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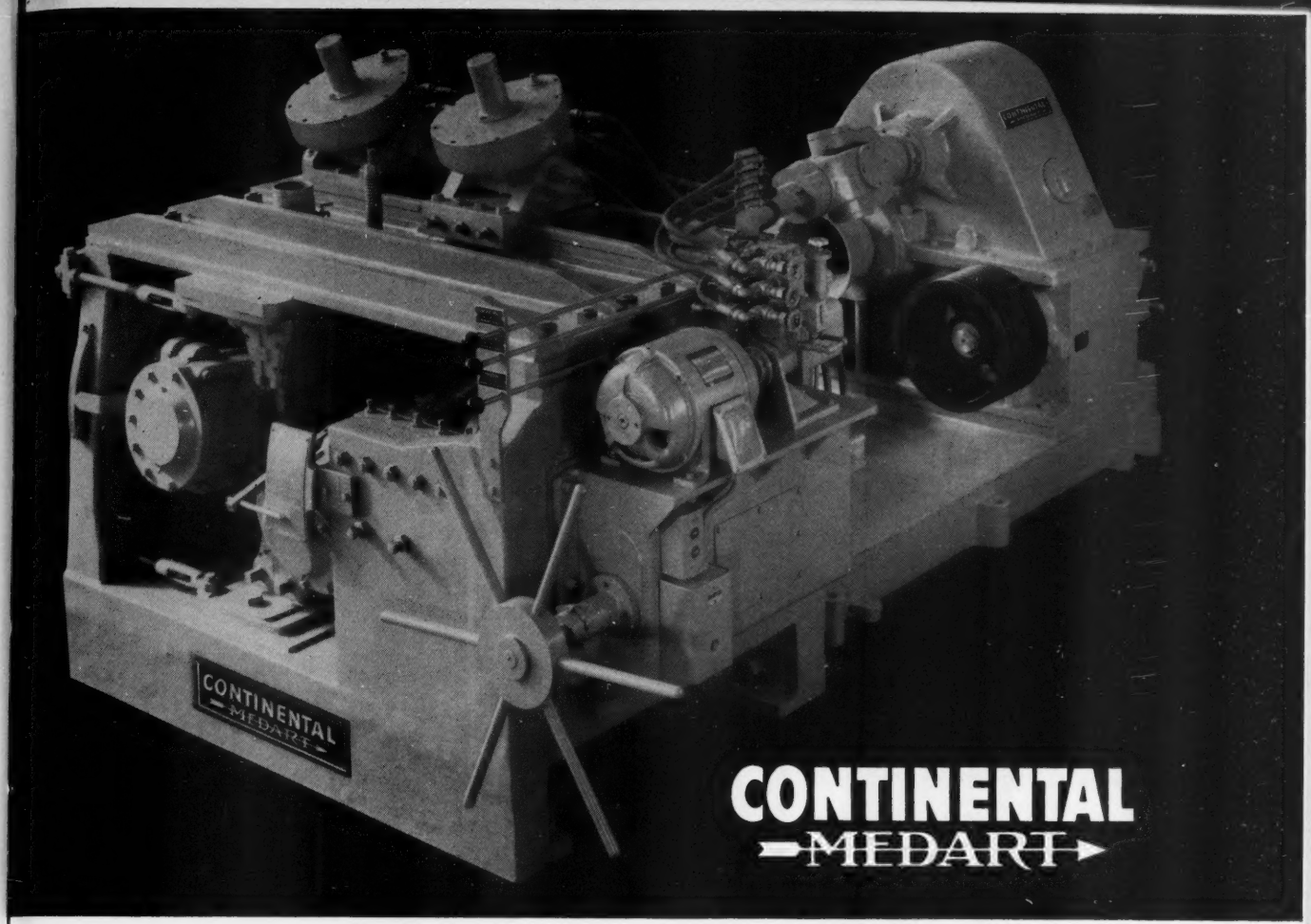

Input end of No. 3 Size 2-Roll Rotary, single motor type

Straightens, sizes and polishes round bars and tubing—*in a single high-speed operation*

that features new push-button roll adjustment

For quality of output, for speed and accuracy, and for production economy, the CONTINENTAL-Medart 2-Roll Rotary has become an industry standard for the straightening, sizing and polishing of bars, tubes and pipe. It is in a class by itself.

And here is why. The CONTINENTAL-Medart 2-Roll Rotary processes work pieces completely from end-to-end in long lengths or as short as 1". It produces an improved finish on hot rolled; imparts a *super-finish* on cold finished; straightens to within a few thousandths; corrects out-of-round and improves physical properties—all in one operation.

In this new and improved design, operation is continuous, uninterrupted. Feed through and discharge is entirely automatic. Setup time is cut down by unique push-button adjustment of roll angularity and pressure settings. Motors will reverse with material between rolls to permit additional passes for sizing and polishing. Throughput speeds up to 400 fpm and higher are attainable, depending upon the size, type and condition of material.

Built in ten different sizes to process rounds over the complete range from ⅛" to 10" diameter, the 2-Roll Rotary is now used in virtually every ferrous and non-ferrous mill on this continent. Why not have a CONTINENTAL-Medart representative show you what this equipment will do for you!

CONTINENTAL

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The Wire Outlook

Business will be good for months to come and evidence now indicates that this year is headed for a new high.

The reasons for this are many. Basic to it all is a well-founded confidence. Personal incomes are at a $292.4 billion annual rate and may go higher; consumers are spending freely, so much so that for the first quarter retail sales were the highest on record—$15 billions, according to Government statisticians; employment has risen sharply; the work-week of labor has lengthened; residential construction is up 33% over last year; new plant and equipment outlays have risen 1% and are expected to be higher in the final tally; industrial production has risen 9% in the last seven months; inventories are holding high—around $77.5 billions; and new orders are up 25% over 1954, with principal strength in durable goods.

Good business is no longer confined to the automotive, steel and construction industries, but is spreading to more and more industries. An encouraging feature of this up-surge is that it is taking place with practically no signs of inflation. Living costs have varied only about one point in three years and prices have remained remarkably steady.

The bullishness of the stock market was cause for concern earlier in the year and has been watched closely by Government officials. However, a series of technical corrections, always followed by recoveries, plus the fact that investors are showing more hesitation, has slowed down trading and officials feel that the danger of a stock market collapse has been minimized. The market situation is considered healthier than for some time. Just before the crash in 1929 trading volume was averaging around 5 million shares per day. Today it is less than 3 million. At that time marginal requirements were 10%; now it is 70%, helping to reduce speculation.

While copper is still in short supply, it is currently felt that before the end of the year there will be ample quantities to meet demands. In the next decade, the need for copper will skyrocket, but new sources are expected to take care of the nation's requirements. The head of a large brass company recently stated that we now have an electric power supply of 102,000,000 KW, whereas by 1965 about 200,000,000 KWs will be needed. This alone would necessitate a large amount of additional copper and copper wire.

The automotive industry has already placed orders for its third quarter wire needs. Farm demand for merchant products is in full swing and some mills are running at higher than rated capacity. Mill inventories are spotty and some merchant product stocks have been exhausted. Construction wire is keeping pace with the building boom.

The spring business, especially for autos, is very tight. Heavy demand for manufacturers' wire is lengthening deliveries. Cold heading wire is going well. Rod of all grades are moving as fast as they can be rolled. Wire rope sales have picked up, especially for highway guards. In fact, of all types of products, wire is more nearly in a boom stage than any other product classification.

One thing to which we can look forward in 1956 is tax cuts. Individual rates will have the inside track. Excise taxes will probably be reduced and corporation taxes may come down a few points. This is anticipated as a result of higher Government income and the expectation of a balanced budget.

While there is a prospect of a strike shutting down part or all of the automotive industry, it is now felt that good business is so widespread that its momentum will keep the wheels of business humming.

—from the Editor's Desk

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The Influence of Nail Design and Manufacturing Practices on Joint Strength

by Allan B. Dove, F. C. I. C., M. E. I. C., P. Eng.
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Hamilton, Ont., Canada

This paper reviews some of the design features of deformed nails and shows their influence upon holding power and use in comparison with smooth shank nails. Mr. Dove gave this paper at the New York Regional Meeting of The Wire Association in New York City on April 28, 1955.

The theme of the Regional Meeting of **The Wire Association** in New York, which has been selected by your Committee, is, "What's New in the Wire Industry," and it would seem to be paradoxical that we have chosen as something "new" the "old" subject of nails. It is true, however, that wire nails use 14% of the total wire rod output of United States,[1] and nearly 19% of the wire rod production in Canada. We are thus dealing with a common product, and few things are more common than a nail. On the other hand, it has been pointed out that the diversity of nail types is common knowledge to few. Nails may be bright, blued, coated or coppered, or they may be needle, diamond, duckbilled, or blunt pointed; they may be made from alloy steels, carbon steels, aluminum, copper or brass and with all these varieties, they may be classified again according to their use, the type of head, the deformation to which the shank is subjected and they may even again be classified according to the relative diameter of their shank, by the use to which they are going to be placed in service.

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The variety of nails obtainable on the market can be said to be an indication, although not the whole picture, of the tortuous route by which nails have advanced since leather thongs, vines and pegs were used to hold wooden members together. Pegs were still in use long after nails had first been invented, simply because nails were too expensive or too hard to obtain, and many examples of this type of construction are still evident in the finely panelled halls of 17th century buildings in Europe, as well as pegged log cabin structures from early Colonial days. Some students trace the history of nails back over 3,000 years and even Biblical reference to their use in construction can be found as far back as 1100 B. C.

The steps leading to the development of the wire nail are of themselves interesting to note in passing. Iron nail forging was an important industry in the British Isles until the end of the 17th century, until it gave way to the cut nail and eventually the machine headed nail, but the first real machine-made nail was the result of an invention by **Jeremiah Wilkinson** in Rhode Island in 1777. His invention started a succession of new ideas on nail cutting machines for the next fifty years, during which about 120 nail cutting machines were patented, few of which were really practical. The importance of the cut nail, however, began to diminish with the invention in France in 1835 of the first machine which would make nails from wire. This process had as its greatest advantage, the cheapness of the new product which meant almost immediate public favour and brought about almost at once the end of extensive manufacture of cut nails. By 1883 the first nail making machines were built in the United States and modern nail making machines

still work on the same general principles found in this early equipment.

* * *

No matter how closely we examine the subject, the idea of driving a piece of cylindrical steel wire through two pieces of wood in order to join them appears quite primitive in the light of what we are now learning about nails. The advent of the threaded nail, the square nail, the Swedish section nail, barbing and coating, brought us to the point where we found it necessary to study more closely the function of a nail in a piece of wood in order to determine just what was happening, and how we could properly develop the properties of the joints so formed. A permanent fastening, depending upon the friction of a smooth cylinder against wood fibres was a great advantage back in 1835. 120 years later, however, we are still making essentially the same smooth shanked wire nail and using devious means to increase its holding power, and incidentally, its value as a permanent fastening for wood.

* * *

The common wire nail, being made from round wire, has, in some measure, deteriorated as wire improved, but the changes were not always readily visible. Improvements in dies back in the early '30's made wire smoother and cleaner and as a result the nail became smoother. Admittedly, it retained size much better than "in the old days" but the fact that the wire was smooth and that the nail was smooth tended to reduce the withdrawal value of the nail. Improved dry lubrication in wire drawing formed a slippery film, which remained on the nails and, if not removed by tumbling, further reduced the holding power of the product. Even the polishing action produced in tumbling tended to increase the smoothness, still further decreasing the resistance to withdrawal. As a result, these improvements in wire decreased the withdrawal values for nails and lowered their values as permanent fasteners.

In an attempt to prevent, in some measure, this lowering of holding power, the manufacturers tried many methods, among which could be found surface coating, acid etching, barbing, section distortion by use of the square wire of Swedish section, tapering of the section as in the cut nail, and finally, threading nails first formed on a nail machine. (see photos 8, 9, 10) All these methods increased, some only temporarily, the holding power of the common nail (photo 10). The only nail which made a material advance in holding power was the threaded nail, although temporary assistance is still given by use of cement coatings and etching.

Cement Coatings

Cement coatings, when applied to a clean tumbled nail, give an improvement in immediate holding power, that is the holding power of the nail immediately after driving. Our research on this subject has indicated that the maintenance of this high initial holding power is dependent upon the type of coating, the type of wood, the grain position into which the nail is driven and the moisture content of the wood. At first glance, it would seem to present an insuperable problem in deciding the efficiency of cement coatings, but the results of our research into this matter over the last two years may indicate the limits under which cement coatings may be useful.

Effect of Wood Moisture

The presence of moisture in the wood fibres would appear to assist the deterioration of the effect of cement coating. We have determined that the removal of the cement coating is not as rapid when the wood contains less than 12% moisture (Graph-Fig. 1); in other words, it is not appreciable when the wood has a moisture value below the "air dried" condition. Our tests have indicated also that Fir has little effect in reducing the value of cement coatings, whereas the pines and spruces show a loss of cement coating holding power on seasoning. Indeed, with high moisture in the "green" state, spruces and pines having moisture contents above 20% reduce the cement coating effect in a very short time, usually within three or four days, and the nail drops to the same or a lower value than that attained by a bright nail with no cement coating at all. Fig. 2 illustrates the loss in holding power of similar cement coated nails produced by various sources, in 12% initial moisture Pine. These tests, which are still under way, may indicate why, in some

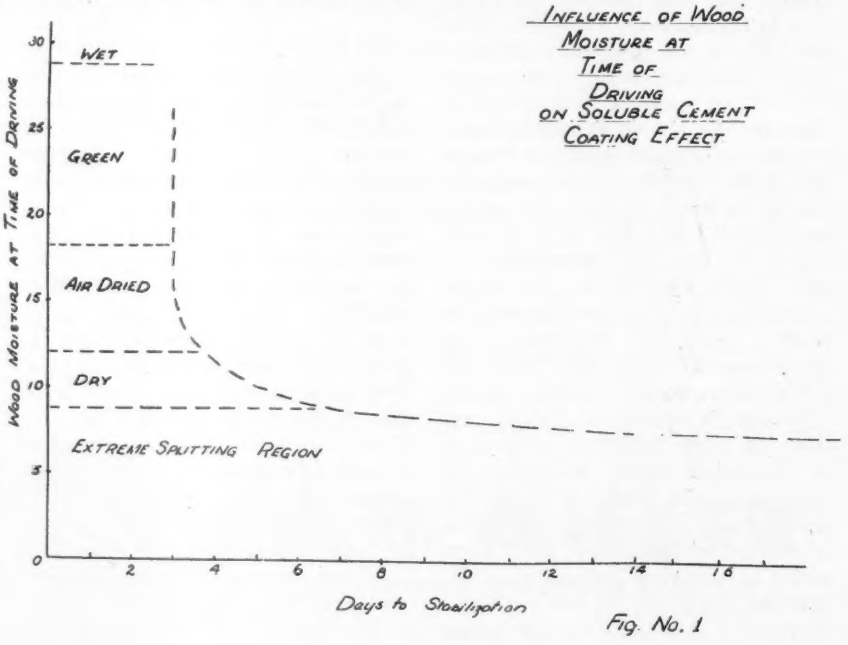

Fig. No. 1

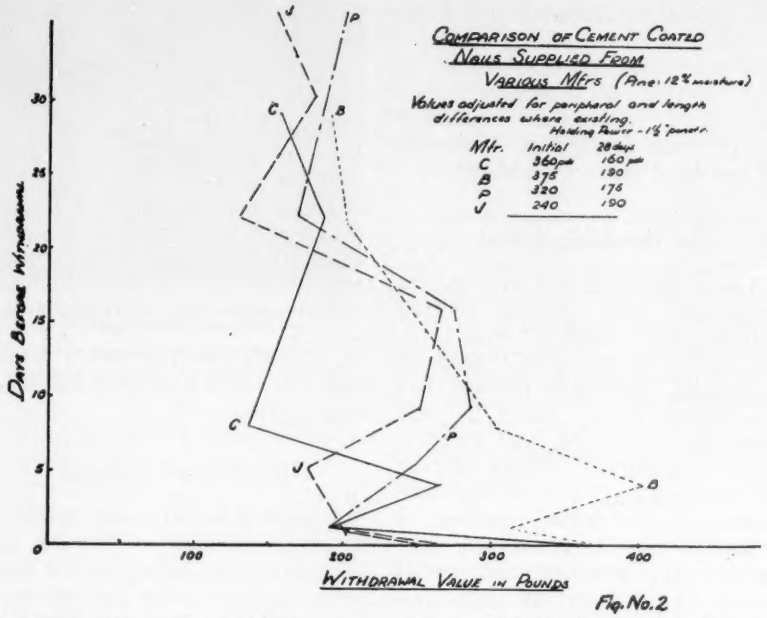

Fig. No. 2

cases, the cement coated nail seems to be very efficient, whilst in others it demonstrates little or no value after the first two or three days.[2,3] In green woods, deterioration of the wood fibres along the common nail shank appears to be somewhat reduced by even regular cement coatings, compared with the plain uncoated shank[4] provided that such coating is retained as far as the second or "holding" member.

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In many hardwoods, cement coatings are not effective since most of the coatings may be removed in the upper member before the nail penetrates the holding member. In contrast, our research has indicated that cement coated nails hold much of their initial advantage in gumwood.

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In order to permit proper feeding of coated nails in automatic box machines, operators frequently dust the coated nails with talc or graphite. Some investigators have noted reduction in holding power of as much as 35%,[3] although we have noted losses of as much as 50% even in immediate values.

Etching

Roughening of round shank nails to overcome the smoothing effect of tumbling has been applied in various ways - from drastic acid etches to a 10% solution of cold monobasic ammonium phosphate; this latter treatment is recommended by the Forest Products Laboratory of the U. S. Bureau of Agriculture.[3] The natural danger which might be expected with acid type etching lies in the retention of acid on the sample, the ease of rusting, and the possible deterioration of the wood fibres after driving. Such difficulties are less likely to occur with phosphate type coating, and tests which we have carried out would indicate that the coatings produced by the Forest Products Laboratory method, while they react somewhat akin to cement coatings, generally maintain their holding power over a longer period. We did find, however, that it was possible to reduce the recommended seven hour period suggested by the Forest Products Laboratory to as low as four hours, with almost identical results. It would appear that the reaction is complete and that passification may commence after this shorter period.

Barbed Nails

Barbing may be classified as either deep etching or partial deformation according to the degree in which it is applied. Should it be carried out as a shallow rounded root deformation, little benefit will be gained; if such nails are coated, the coating often fills in the entire depression, and after a slight rise in immediate values, the nail is little better than if smooth shanked. If, on the other hand, the shank be deeply barbed with a buttressed deformation on two sides, the nail will assume holding properties similar to a helical deformation, but lesser in degree than for a full annular thread, after only a few days' seasoning.

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The disadvantages of the deeply barbed nail are:

(a) The frequency of breakage in driving.

(b) The high cost of deep barbing.

(c) The count per pound cannot, generally be increased by raising the carbon value and reducing the area of cross section, since this would further increase the possibility of breakage and cost of barbing the harder stock.

The Deformed Nail

With the term "deformed" we intend to convey the idea of a change of section from the normal round shank. Generally nails are deformed for the purpose of increasing the holding power of the nail, to reduce the section, or a combination of these by which the section is reduced and holding power is maintained or increased. Examples of these various nails are shown here in Figures 8, 9 and 10. The general deformations which we will consider are:

(a) The Swedish nail design
(b) Roll Thread Helical deformation
(c) The twisted square
(d) The annular roll thread deformation

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Silhouettes of some of the forms are shown in Photo No. 1

(a) The Swedish Design

The Swedish nail[6] is designed, primarily, to reduce the cross-section of the nail in such manner that the peripheral area is of the same value as that of the round nail having a diameter equal to the diagonal measurement of the Swedish section. Tests of holding power (see Fig. No. 3) have illustrated that this point is achieved

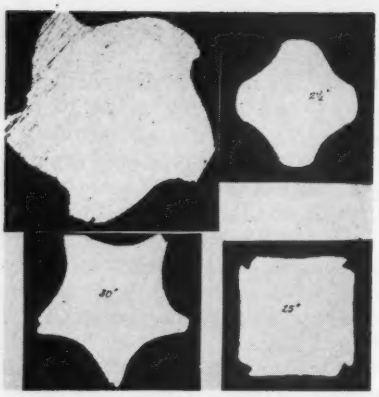

Photo No. 1—Silhouette Forms of Popular Deformed Nails

Upper Left - U. S. manufacture, Roll Thread Form

Upper Right - Swedish Rolled Section

Lower Left - Prutton Roll Thread 5-Start figure

Lower Right - Prutton Roll Thread 4-Start figure

and that the Swedish nail actually has virtually the same holding power as the round nail. Its advantages lie in the greater count of the nails per pound and the reduction of splitting by virtue of the decreased cross-sectional area, provided that the nail is driven in such manner that its minimum dimension is at right angles to the direction of grain in the wood. Generally the reduction of section is drastic enough, however, to indicate less splitting of the wood even when the nail is turned across the grain of the wood. The force necesary to drive the nail is reduced in proportion to its cross-sectional area compared to the equivalent round. This design is laid down according to the measurements shown in Figure 3. This section is generally rolled and the corners are rounded rather than square as indicated by the ideal section drawing.

(b) The Helical Nail

The helical nail is found in two variations, the parallel crested helix of the "ARDOX" wire type, made only by **The Steel Company of Canada, Limited** at present, and the rolled helix, which is roll threaded either by the Prutton method, using a circular die, or the conventional roll thread machine. In the latter method, a thread is rolled on a common nail, leaving a portion of unthreaded shank. The roll thread type helical nails have their threads formed upon round shank nails, whereas the "ARDOX" procedure commences with coiled "ARDOX" wire, which is cut into nails from wire coils. With the "ARDOX" nail, the thread form carries right on up to the head and there is no round shank. The helical nails of this group may be made in various carbons, within broad limits, and can generally, by carbon selection, be hardened without special heat treatment prior to nail making.

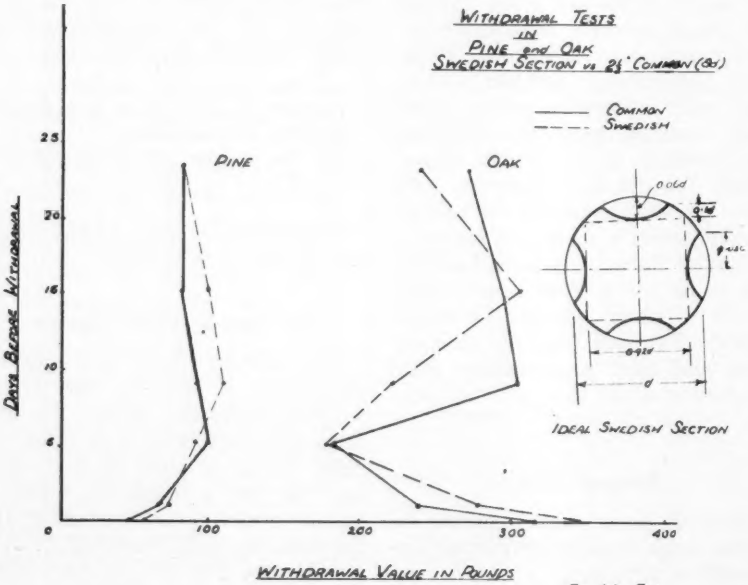

Fig No 3

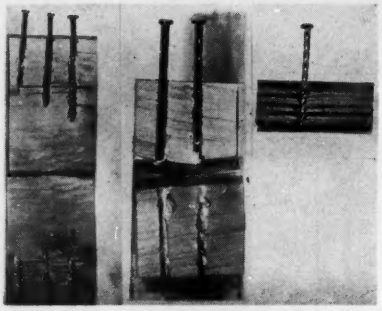

Photo No. 2—Illustrating the Threading Effect of Various Helical Nails

Left - "ARDOX", Roll Thread and Prutton

Center - Common 8d and 2½ x 10 "ARDOX"

Right - "ARDOX" in Fir

(c) Twisted Squares

Square wire may be produced by either rolling or drawing and is then twisted into a helical form by a machine such as that used by the Screw Nail Syndicate of Oslo, which practice limits the maximum wire size to about 9 Gauge, or else the wire may be twisted as it is rolled on a revolving turkshead type equipment, such as used here in the United States. The limitations of these processes all lie in the fact that it is difficult to twist a stiff wire, and generally speaking, the material must be of low carbon, or medium carbon stock, softened prior to twisting. If the nail product produced from this wire is not stiff enough to withstand driving, it is necessary to heat-treat the finished nails once more, especially where the product is required for hardwood pallet-making.

(d) Annular Roll Threads

The annular buttress type roll thread nail, shown in Photo No. 9, is formed by roll threading as in (b) with the exception that the thread crests do not lie at an angle, but are generally at right angles to the shank of the nail. These nails, too, generally have an unthreaded round shank under the head.

Wood Structure and the Effect of Nail Penetration

Let us now consider what happens when a round shank nail is

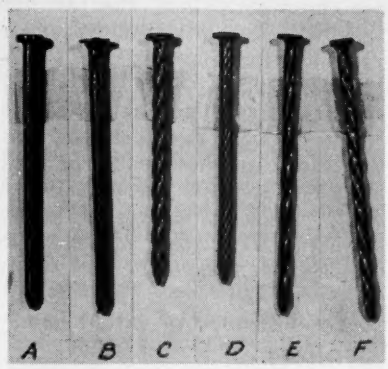

Photo No. 8—Typical "Common" Nails.
The nails shown here are, by cost to the consumer considered to be in the "common" nail price field.

	Shank	Max.	Min.	Lead	Crest Angle	Max/ Min. Ratio
A.	0.1285					
B.		0.129	.098"			1.31
C.		0.126	0.102	0.82	25°50	1.24
D.		0.125	0.106	0.82	25°40	1.18
E.		0.115	0.095	1.35	15°0′	1.21
F.		0.131	0.106	0.90	24°50	1.24

A - 2½" (8d) common
B - 2½" Swedish
C - 2¼ x 10¼ "ARDOX"
D - 2½ 8-start "ARDOX"
E - 2½ x 11 "ARDOX"
F - 2½ x 10 "ARDOX"

other unbroken fibres. If we disregard for the moment the effect of point design, it will be seen that a round shank nail will jam down and break off more pieces of fibre the longer the nail. A helical nail turns down as it is driven as shown in Photo No. 2, and has positive compression upon the fibres at the crests of the threaded portion, while the wood structure tends to turn away from its normal grain position through an angle to lie in the grooves formed by the helical thread. The buttress type annular threaded nail holds the fibres downward breaking some of them and jamming them in position against the still-connected fibres.

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If the wood loses moisture, which is generally the case especially in construction work where the wood is brought in from an outdoor storage, the wood fibres shrink away from the nail

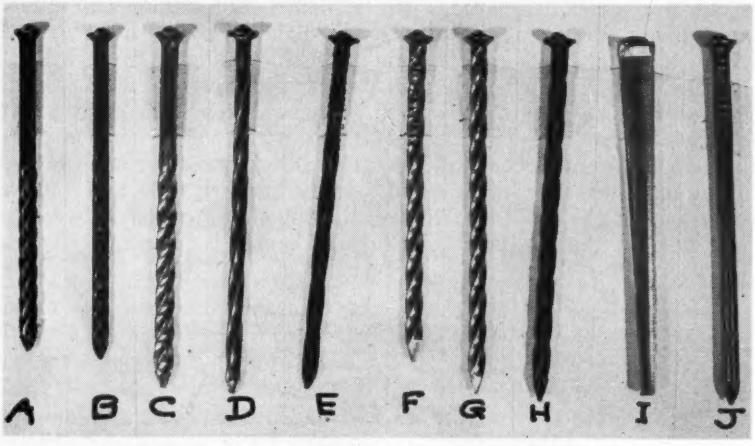

Photo No. 10—Typical Flooring Nails and Their Characteristics. It will be noted that crest/root ratios vary between 1.09, as in B to 1.30 as in A. The "ARDOX" samples have ratios 1.21" to 1.25".

Flooring Nails Type		Shank	Max.	Min.	Lead	Crest Angle
A. Roll Thread	(2¼")	0.116"	0.131"	0.100"	0.70"	30°40
B. Roll Thread	(2¼")	0.112	0.117	0.107	0.70	26°30
C. Roll Thread Prutton	(2½")	0.122	0.137	0.107	0.80	25°45
D. "ARDOX" Bright	(2½")		0.115	0.095	1.35	15°0′
E. "ARDOX" Heat Treated			0.115	0.095	1.35	15°0′
F. "ARDOX" Bright	(2")		0.125	0.100	0.80	26°20
G. "ARDOX" Bright	(2½")		0.125	0.102	0.80	26°20
H. "ARDOX" Heat Treated	(2½")		0.126	0.103	0.85	25°10
I. Cut Flooring	(2½")			0.119		
J. Smooth Shank Flg.	(2½")	0.1285				

driven into a piece of wood. As will be seen in Photo No. 3, fibres all bend down in the direction of travel of the nail and some are broken off and jammed in position between the nail and the and then try to rise into their former line parallel to the wood structure. As this happens, the holding power of the nail falls rapidly as the wood shrinks and then commences to rise again as

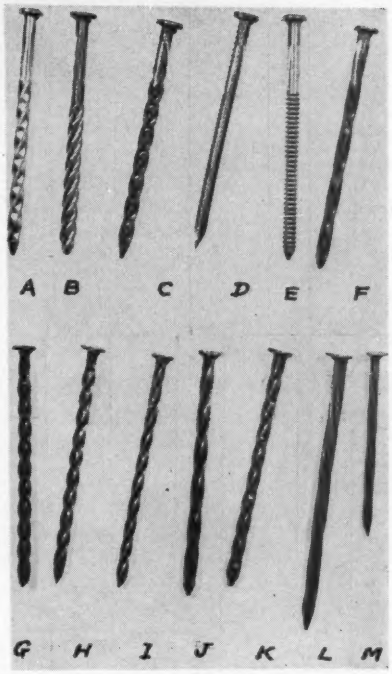

Photo No. 9—Typical Pallet Nails
The chart shows the method of manufacture and characteristics. Concavity of groove as in "B" and "L" shows high crest/root ratio, but this frequently becomes ineffective.

	Pallet Nails Shank	Out-side	Min.	Lead	Crest Angle
A. Process Prutton Roll Thread Type	0.135	0.146	0.128	1.15"	21°40
B. Prutton Roll Thread	0.137	0.170	0.113	0.90	30°50
C. Roll Thread	0.132	0.152	0.113	0.95	26°50
D. Barbing Roll Type	0.129	0.134	0.111		
E. Annular Roll Thread	0.137	0.154	0.120	20	thds/in.
F. Oslo Twisted Square		0.140	0.114	2".0	12°25′
G. "ARDOX" 10¼ Ge.		0.125	0.103	0.90	23°40
H. Revolving Turk's Head Coated		0.136	0.105	0.82	27°30
I. Revolving Turk's Head		0.136	0.106	0.90	26°30
J. "ARDOX"		0.143	0.120	1.50	16°45
K. "ARDOX"		0.144	0.121	1.00	24°20
L. Revolving Rolls		0.144	0.108	2.00	12°50
M. Revolving Rolls		0.105	0.087	2.80	6°45

the fibres try to return to a horizontal position.

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The wetter the wood at the time of driving, and the greater the loss of moisture during seasoning, the greater the advantage gained by the helical nail in withdrawal value, whereas the smooth shank nail, after an initial loss in holding power, generally returns to about the value obtained at the time of driving. (Fig. No. 4)

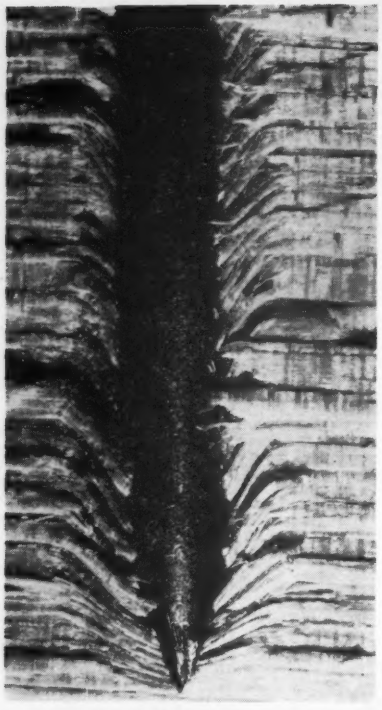

Photo No. 3—Fibres Bending Around the Common Nail.

This particular nail has a wedge point driven at right angles to the grain.

Photo courtesy of the Forest Products Laboratory Division Department of National Resources, Canada.

Holding Power of Nails

The usual formula applied to timber fastening design for **round shank nails** is:

$$P = 6900\ G^{5/2}\ D \text{ (Ref. No. 7)}$$

where P = Withdrawal load per nail per inch of penetration (holding power)

G = Specific gravity of wood used based on oven dry weight

D = Diameter of the common nail in inches.

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Due to splitting tendencies and other physical characteristics of the various wood species, a factor of safety of six is usually applied to this equation, and the formula for safe loading of **round shank nails** becomes[7, 8]:

$$P = 1150\ G^{5/2}\ D$$

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Safe resistance to withdrawal is very variable depending upon the wood used, and in the case of an 8d 2-1/2" nail, may vary all the way from 14 pounds per nail per inch of penetration to 60 pounds in the range of woods between spruce and oak. Under these conditions, our research was directed to comparing nails rather than determining actual holding power value in pounds for any one kind of wood. For the greater part, our research was carried on in pine, fir and oak, although trials were also made in elm, birch, gumwood, cottonwood and maple to round out our knowledge of the effects of the various nail designs.

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Generally speaking, with a round shank nail or a nail having a uniform cross-section in projection, the holding power is closely related to the area of the shank of the nail in contact with the wood and to the physical properties of the species used, provided that no splitting occurs when the nail is driven into the wood. Under these conditions, it will be seen that a square nail or a Swedish grooved nail can be expected to have properties compared with round shank nail, as shown in Figure 3, which will correspond generally with the surface area in contact with the wood fibres. On the other hand, the helical nail will have different properties, depending upon whether it is allowed to turn out of the wood or if it is firmly held in the top board. Under these conditions, the test for nail withdrawal laid down under such specifications as ASTM D-1037-52T and D-143-52 by direct withdrawal are not applicable to deformed nails, and these are better tested by the separation of a joint made of two pieces of wood of known dimension, especially since this is a closer approach to the use of nails in service.

The Influence of Extent and Type of Deformation

Deformed nails have variable holding powers, dependent upon the nature and extent of deformation. Our research was directly concerned with our new "ARDOX" process, but it was necessary to investigate many other threaded nails in order to provide adequate comparison.

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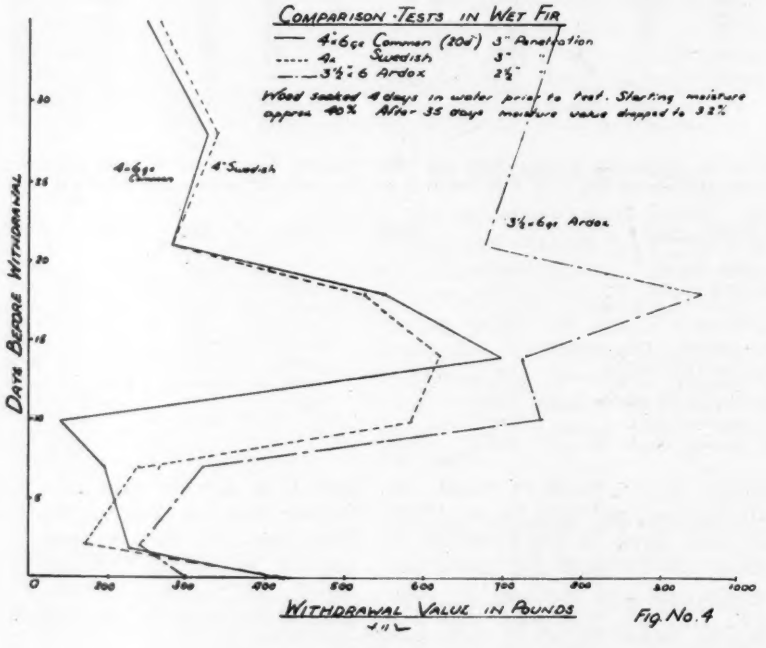
It will be obvious that the numerical difference between maximum and minimum dimensions of a deformed section will influence the holding power of a nail, and that the holding power will, generally vary directly with the depth of penetration. The ratio between crest and root dimension for 10 Ge. shank threaded nails lies generally between 1.20 and 1.30, and the lineal projection between root and crest is normally between


Comparison Tests in Wet Fir
4"x6g Common (20°) 3" Penetration
4" Swedish 3" "
3½"x6 Ardox 2½" "
Wood soaked 4 days in water prior to test. Starting moisture approx 40% After 35 days moisture value dropped to 32%
4"x6g Common
4" Swedish
3½"x6g Ardox
Days Before Withdrawal
Withdrawal Value in Pounds
Fig. No. 4

0.010" and 0.018". In smaller nails the difference varies, generally directly, with the shank diameter.

★ ★ ★

Annular threads, as a rule, provide substantially higher holding power than helical threads; once the joint has separated more than the pitch of thread form, however, holding power falls rapidly. With the helically threaded type, considerable holding power is sustained during much of the withdrawal provided the nail does not turn out of the wood.

★ ★ ★

Since the "ARDOX" nail is threaded to the head, thread form is continuous through both joined members. This threaded form, especially in denser woods, acts in both members, to prevent separation; in softer woods where compression forces may pull the head through the upper member, we have noted that threaded-to-head nails fail less frequently in this manner than do similar threaded nails with partially unthreaded shanks.

★ ★ ★

The angle of helix in threaded nails, i.e. the angle of the thread crest to the longitudinal axis of the nail, is extremely important to holding power. Angles in use in most popular helical nails vary from six to thirty-one degrees; for any one area of cross-section, the holding power generally varies directly as the numerical value of tangent of the angle of helix. If we consider the tangents of the angles between ten and forty degrees, we find:

Angle	Tangent of Angle	Difference as Percentage
10°	0.176	
		51%
15°	0.268	
		36%
20°	0.364	
		28%
25°	0.466	
		24%
30°	0.577	
		19.8%
35°	0.700	
40°	0.839	

It will be noted that the difference between five degree groups becomes smaller as the angle increases. In actual test, little difference was noted in the holding power of samples at angles in excess of thirty degrees. Consistent with the area of the section and the use for which the nail is intended, helically threaded nail angles generally lie between twenty-one and thirty degrees.

★ ★ ★

Still another feature was displayed in our research into the section form in regard to the sharpness of corners on squared sections. In general, "ARDOX" sections have slightly rounded corners and have crest/root ratios between 1.20 and 1.27—well within the usual range found in roll-threaded and twisted forms. The holding power of joints made with "ARDOX" and other helically threaded nails throughout our tests, was, for similar crest dimensions very comparable. For this reason, and because of the number of tests on "ARDOX" nails carried out throughout our research, we have used "ARDOX" values to demonstrate the various features of helical nails throughout this paper. It should be noted that the gauge used on "ARDOX" nails is Imperial Standard, and that measurement is made over the crests of the thread deformation. Because of the nature of the manufacturing process, an "ARDOX" nail can be readily identified by microscopic and chemical means.

The Bending of Nails During Driving

Common practice has automatically set up a bend value standard for the common nail. This value can be designated as an:

$\frac{l}{r}$ — ratio as for short columns,

where l is the length of the nail in inches, and
r is the least radius of gyration of the section.

★ ★ ★

For common nails, the value of l/r generally lies between 77 and 87. Whilst studying this effect, we developed a bend test in which the nail is bent by pressure exerted centrally on a nail supported and free to bend over rounded surfaces at two points 1-1/4" apart. When the results are plotted against length and diameter, a straight line is evolved.

★ ★ ★

The research into nail driving had not gone very far before we found that, in the unhardened spiral nail in actual usage, there is a **tendency** toward bending, even when similar gauges of "ARDOX" and Common nails had identical bend values as determined by the 1-1/4" bend test. We increased the carbon value of the "ARDOX" section to allow for the loss of section between round and pseudo-square, and still the common nail drove with somewhat fewer bend failures.

★ ★ ★

There appeared to be several reasons for this effect:

(a) Hand-hammered nails are driven with variable load and direction.

(b) The helical nails rotate as they are driven, and if slight bending takes place the head moves in a circle presenting different faces to the hammer.

(c) If we consider a longitudinal half section or the plane projection of a helical nail, it is a non-uniform shape with a series of minimum and maximum dimensions, the frequency of which is determined by the lead of the helix. The shorter the lead, i.e. the shorter the longitudinal distance in which one complete crest revolution takes place, the greater the number of points at which bending could take place.

★ ★ ★

Factor (c) appeared to be the governing one. We therefore redesigned our leads and angles so that where nails are to be driven by heavy blows, as with sledge-hammer or compressed air driving, the lead is lengthened and the angle decreased.

★ ★ ★

One effect, totally unsuspected, was that of increased carbon. True, if the carbon value were increased we obtain the expected increase in stiffness, but the effect goes even farther. We found that less force was required to drive higher carbon nails of identical helical angles. In actual trials it was determined that 10-16% less force was required to drive bright helical "ARDOX" 4" x 7 and 4" x 8 Ge. nails when made

from C-1045 than when made from C-1035 stock.

★ ★ ★

In studying this effect we came to the conclusion that, when nails are near the critical bend value, the column bends slightly with each blow. If the force exerted at the periphery by bending does not exceed the elastic limit of the external fibres, the nail returns to an upright position, absorbing a portion of the applied load; the amount of power absorbed is a function of the amount of bend. Should the bending force exceed the elastic limit of the fibres, the nail bends.

★ ★ ★

Applying this theory to the helical nail, we provide agreement with the lesser driving force required for the stiffer nail having otherwise identical physical properties. This modification becomes necessary, however, as pointed out above, only when the nail length approaches a critical value for a particular helical section.

★ ★ ★

Knowing these facts, we are now in a position to design our unhardened helical nails on a basis of minimum section. If we find a 10 ge. or 8d common nail, for example, to be just satisfactory in driving in a certain type of wood, a bright helical nail should have a similar $\frac{1}{r}$ value compensated, by charge in tensile value, for the charge in section at the root—the possible point of bend. If the $\frac{1}{r}$ value for the common nail in 2½" length is 78, the compensated value for the helical nail should not greatly exceed this. In the same carbon (assuming A.I.S.I. 1018 stock), a 10 ge. helical "ARDOX" nail would have a $\frac{1}{r}$ value of 85. If produced from A.I.S.I. 1035 steel, the value of $\frac{1}{r}$ becomes 70. If 10-1/4 ge. stock were used in the higher carbon, $\frac{1}{r}$ would have a value of 81, and would have a slightly greater tendency to bend than would the common nail. A study of this type will determine, for each size, the possibility of bend at any specific length in a deformed section. Similar calculations may be carried out on annular rolled thread types.

★ ★ ★

We should note, in passing, that the resistance of nails to driving is further influenced by the cross-sectional area of the nail, and the specific gravity and moisture content of the wood. Thus a nail suitable for soft woods, or wet hardwoods, may be entirely undesirable for use in dry medium woods, such as Fir. We have, however, found that a compromise in design, with normal safety factors, can readily allow for such variations in usage.

The Effect of Heat Treatment

Apart from the expected result of increased stiffness imparted to a nail by solution heat treatment —hardening quenching and drawing operations—other effects, not usually expected, may accrue. Let us consider the effect in oak shown in Table A:

Table A: Effect of Heat Treatment and Surface Change on 2½" x 11 "ARDOX" Nails in wet and dry oak

Nail	Soaked Oak (40% Moisture) Withdrawal Value			Dry Oak (7% Moisture Withdrawal Value		
	Immed.	22 Days	Ave.	Immed.	31 Days	Ave.
2½ x 11 "ARDOX" Brt.	292	400	374	370	310	380
2½ x 11 " H.T.	415	485	494	657	763	762
2½ x 11 " Blued	382	442	442	795	690	711

As seen in the table, under actual test these nails act quite differently when hardened and scaled. In hardwood the withdrawal value of the scale covered nails is tremendously increased. In softwoods the advantage is limited to slightly raised "immediate" values. Table B shows one test series of this type and indicates that heat treatment of nails is of no advantage for use in soft woods.

Table B: Effect of Heat Treatment of Helical "ARDOX" Nails Compared to untreated Bright "ARDOX" in dry Pine

Nail	Withdrawal Value in Pounds					
	Immed.	4 Days	21 Days	25 Days	37 Days	Avg.
2½ x 11 "ARDOX" Brt.	162	175	215	200	230	203
2½ x 11 "ARDOX" H.T.	162	170	225	210	250	210

★ ★ ★

If, for formal heat treatment, we were to substitute a simple bluing operation, we find a somewhat similar condition, slightly lower in degree. This treatment, however, will not increase, and if improperly controlled, will actually decrease the stiffness of the nail.

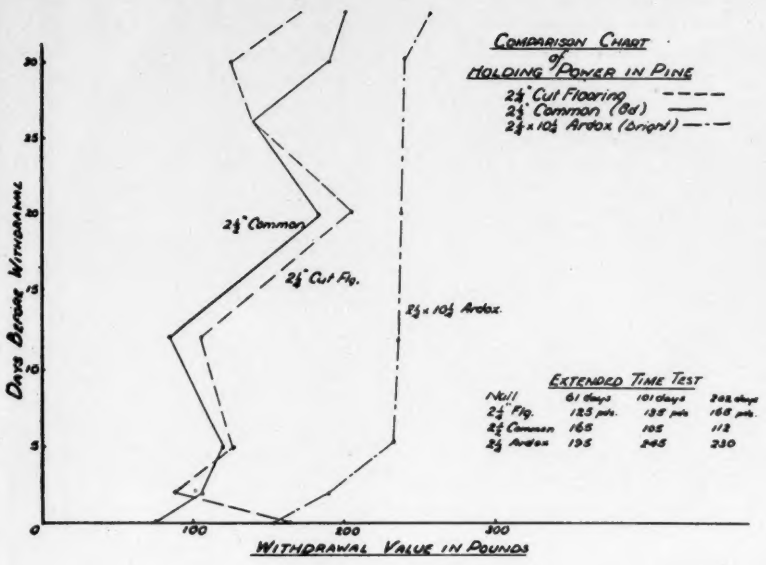
★ ★ ★

If we were to cement coat the heat-treated nails shown above, we would find that almost no advantage accrues in the air-dried hardwoods. In an actual test conducted over a forty-day period in dry oak, it was found that 2-1/2 x 10-1/4 "ARDOX" heat treated nails actually lost 10% of their holding power when cement coated. It would therefore appear that the wood/scale friction coefficient is greater than that of wood/scale /cement coating, and that such coating is wasted when applied over the scaled surface.

Flooring Nails

Until a few years ago, the cut nail held the field as the ultimate in flooring nails. In 1895, in the United States nearly one-third of nail production was in cut nails. In 1952 the proportion had dropped to 1/28th. Cut flooring nails are still used in considerable quantity in some areas of Canada and United States where users claim certain advantages to their use, including experience and low direct cost compared to threaded nails.

One test series involving the 2-1/2" common (8d) 2-1/4" flooring, and 2-1/4" helical "ARDOX" nails is shown at Fig. 5. This test



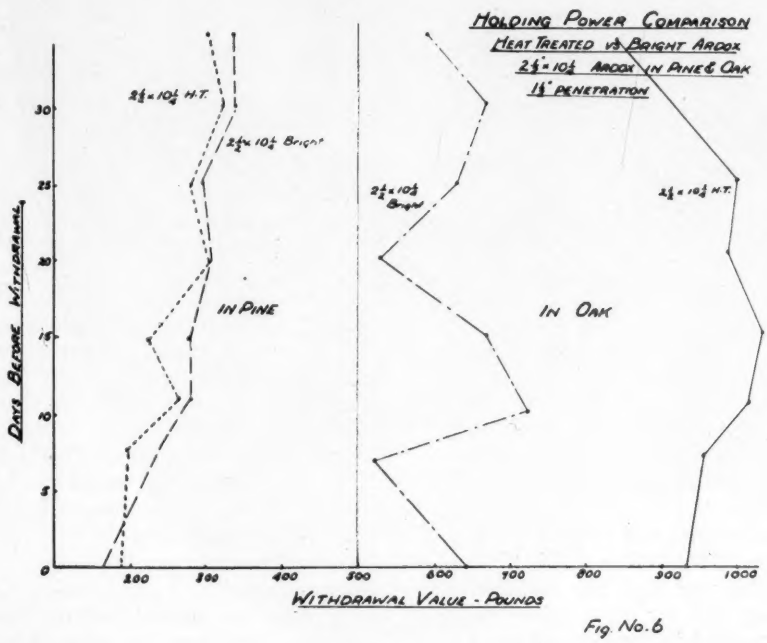


Fig. No. 6

indicated some advantages for cut nails over 2-1/2" common in tests up to over 200 days seasoning, although the advantage was not pronounced in tests up to 60 days. The "ARDOX" helically threaded nail, however, showed an average increase of 58% in holding power over the cut nail over the entire test period.

★ ★ ★

When we consider even the physical energy required to carry cut nails about on a job, with their low count per pound, compared to threaded 2-1/4" "ARDOX" with a 63% increase in the number of nails per pound, along with the higher holding power of the helical nails, these facts would appear to provide non-assailable argument for "ARDOX" nails or other threaded types over cut nails. Add to this, however, lesser tendency toward splitting and the fact that 37% less energy is required to drive, for example, the "ARDOX" nail, and we can only assume that all the users have not yet heard that there is a cheaper, more efficient fastener available at lower cost.

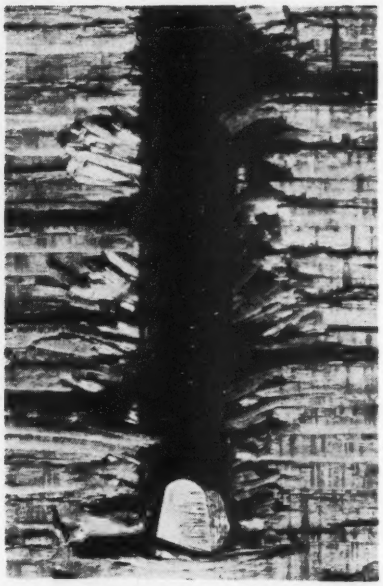


Photo No. 4—The Effect of a Wedge Point Driven Parallel to the Grain.

Note the crushing and breaking of fibres which has occurred here.

Photograph courtesy of The Forest Products Laboratory Division, Department of National Resources, Canada.

Splitting Effect

Splitting in woods can be avoided in some measure by:

(a) Predrilling
(b) Reduction of nail section area
(c) Proper choice of points

★ ★ ★

In woods having less than 7% moisture, splitting is to be expected even with the greatest care in selection of nails. Predrilling to about 85% of the root measurement of a threaded nail, or of the shank diameter of a round shank nail, will generally avoid splitting.

★ ★ ★

Reduction of the area of cross-section of the nail will generally reduce the degree of splitting. Since "ARDOX" nails are reduced in area by at least 20% below those of the equivalent gauge of common nail, less splitting is naturally to be expected.

★ ★ ★

Points are of utmost importance. Nails with blunt squared points are commonly employed in woods that are likely to split; such points cut, or tear by impact, a large hole thereby reducing the tendency to lateral compression of wood across the grain, but the

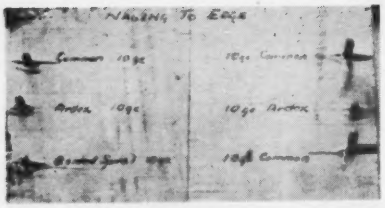


Photo No. 5—Effect of Nailing close to the edge in dry pine.

Note that less splitting has occurred in every case with the smaller cross section helical nail.

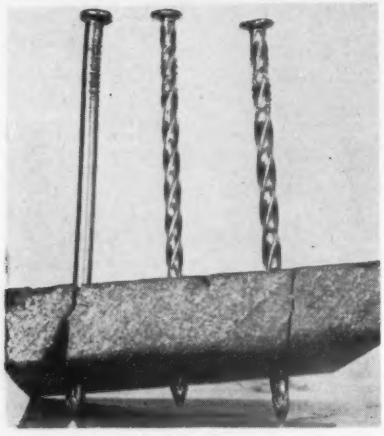


Photo No. 6—Splitting Effect in Dry Spruce.

The outside nails are 6Ge. common and "ARDOX". The center nail is 7 Ge. "ARDOX". Dry Spruce is very prone to split on nailing near to the end.

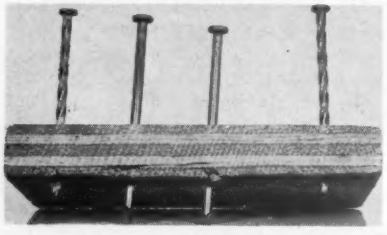


Photo No. 7—Splitting Effect in Plywood.

It will be noted that the common nail although in the most favourable position has split the lower lamination. The nails are all 10 Ge. external measurement.

holding power may be reduced by disruption of the structure. Sharp wedge points produce either a splitting or cutting effect according to the relation of cutting edge to the grain. Were the wedge point to be driven with the point parallel to the fibres there is almost no cutting action, the nail simply forces aside the wood in its path, greatly lessening holding power,[8] as shown in Photo 4.

★ ★ ★

A long sharp point can be desirable from the point of view of drivability and holding power provided that splitting does not occur, but such a point does assist this type of failure.

★ ★ ★

Splitting is not generally a factor in nailing soft construction lumber having 12-18% water content (air dried) or higher value where diamond points are used. In finishing or trimming woods, where the lumber may be kiln-dried and splitting tendencies are decided, a blunted diamond performs well. The same is true in boxwoods and some hardwoods. Spiralled nails having wedge points would produce irregular fibre fractures similar to that shown in Photo No. 4. Comparisons between the reduced "ARDOX" sections and common nails are shown in Photographs 5, 6 and 7.

The Lateral Strength of Nailed Joints

The U. S. Forest Products Laboratory[7] has developed the equation:

$$P = KD^{3/2}$$

where K—is a constant for the wood species used. Values of K for white pine, douglas fir and oak are respectively 900, 1375 and 1700.

D—is the diameter of the nail in inches

P—is the allowable load per nail in pounds.

★ ★ ★

This equation assumes that the depth of penetration of the nail shall be not less than fourteen times the diameter of the nail for softwoods and ten times for denser types.[7] The value of P is reduced by 40% for end-grain nailing, and by 25% when the nails are used in unseasoned wood which will remain wet, or which will be loaded before seasoning takes place.

★ ★ ★

When unhardened helically threaded nails are substituted for round shank nails of the same cross sectional area, we find, as a general rule, an increased lateral stress value. This is to be expected since the lateral strength of a joint is a direct function of three factors:

(a) The projected area of the nail
(b) The bend value of the nail
(c) The holding power of the nail.

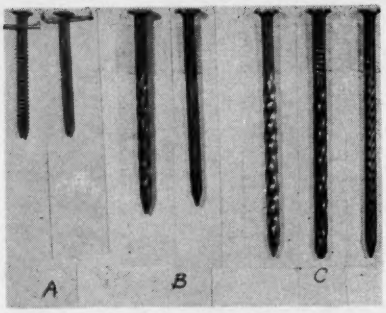


Photo No. 11

Sample A—1-¼" Roll Thread Underlay Flooring. The sample on the right has poor thread form due to worn dies, resulting in a loss of holding power of over 30% compared to the nail at the left.

Sample B—2" Rolled Thread Pallet Nail. Over 10% of the shipment had no thread as shown at the sample at right. Loss of holding power compared to nail at left—28%. Cause—poor die-setting and worn roll thread dies.

Sample C—2-½" Roll Thread Pallet Nails. Few good nails were found on examination of this shipment. The variation in thread form resulted in holding power losses up to 40%.

Under these conditions, if (a) and (b) are alike for common and helical nails, and (c) is higher, for the helically threaded nail, the lateral strength of the joint will be increased.

★ ★ ★

In the case of "ARDOX" nails, the usual substitutes for common plain shank nails have 20-53% less cross-sectional area, but for, equal lengths, there is only 10-22% less area in contact with the wood. Due to the increase in carbon value represented by a change from A.I.S.I. 1018 to A.I.S.I. 1035, bend values are about equal. Since direct withdrawal values are considerably increased, equal or improved lateral strength can be expected in single shear.

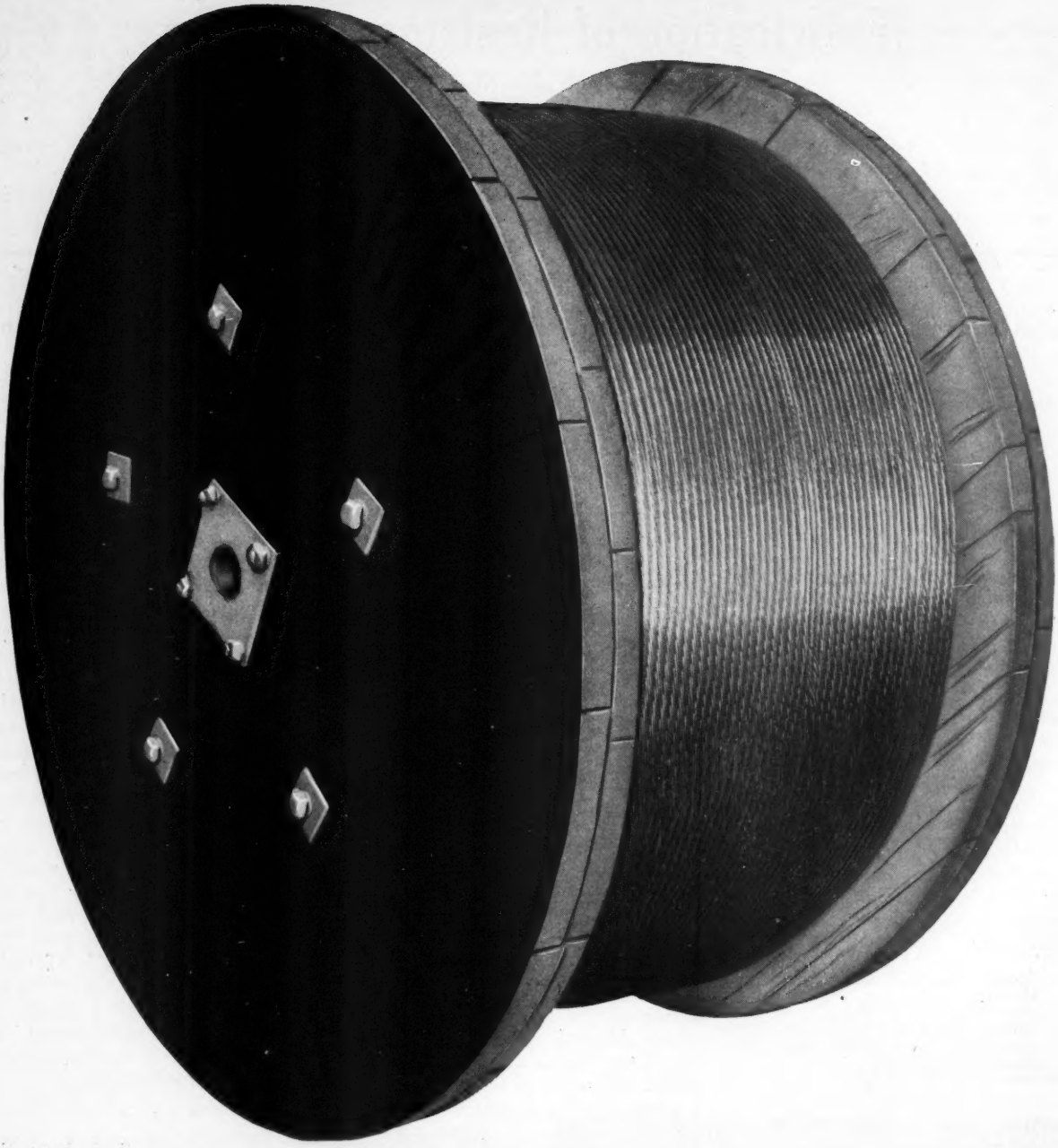
★ ★ ★

Should the helical nail be heat treated, however, the value in lateral resistance is again raised in hardwoods, by virtue of the increased holding power and bend value, and, in softwoods, because of the increased bend value alone. Furthermore, nail diameters may be reduced if hardened nails are used, and this, of itself, will increase the strength in lateral loading by reduction of the tendency toward splitting during nailing.

★ ★ ★

The strength of a nailed joint in double shear can, generally, be as-

(*Please turn to page* 724)



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Fabrication of Resistance Alloys

by William L. Stryker
Chief Process Engineer
Wilbur B. Driver Company
Newark, New Jersey

Many of the comforts and luxuries of our modern industrial civilization have been made available to us because of the electrical resistance and the excellent oxidation resistance of the nickel-chrome-iron alloys. These resistance alloys, which are rarely seen, are the heart of the electrical appliance that has become so essentially a part of the modern household.

★ ★ ★

Because the Electrical Appliance Industry uses the major part of our production, it is only natural that the many different resistance alloys would be better known in this field. Therefore, it might be well at this time to name and classify a few of the more commonly known alloys.

★ ★ ★

First, the Tophets are important because of their ability to produce heat. This makes them ideal for such appliances as toasters, percolaters, heaters, broilers, hair driers, etc.:

Tophet A — 80% nickel and 20% chrome
Tophet C — 60% nickel and 15% chrome, remainder iron
Tophet D — 35% nickel and 20% chrome, balance iron

★ ★ ★

Then there is Evanohm, an alloy of nickel-chrome with aluminum added. This alloy is widely used to wind precision resistors of high ohmages and low temperature coefficients.

★ ★ ★

The alloy Cupron (45% copper, 55% nickel) is widely used as thermocouple element as well as resistor wire.

★ ★ ★

A portion of the radio industry is well acquainted with Rodar (nickel, cobalt, iron) used as a glass-to-metal sealing alloy.

The author received a Bachelor of Science degree in Chemistry from Cumberland University in Lebanon, Tennessee. He was first employed by the Wilbur B. Driver Company as a chemist. During this period he studied Metallurgy at the Newark College of Engineering. He held the position of assistant Chief Chemist before being appointed to his present position in 1952.
Mr. Stryker presented this paper at the Regional Meeting of The Wire Association held in New York City on April 28, 1955.

Another cobalt-nickel alloy known as Cobenium is used by the Precision Spring manufacturers.

★ ★ ★

Beraloy (A and D) alloys of Beryllium Copper are important because of their excellent spring properties after heat treatment.

★ ★ ★

Nilstain is well known to all of you as Stainless Steel.

★ ★ ★

These are a few of the alloys that play a small but extremely important part in our present day industrial civilization. They represent a minor part of the cost, but they do make a major contribution to the functions of almost every electrical apparatus or appliance that you can conceive. These alloys are required, in general, for a control or regulatory function where precision is of the utmost importance. Accordingly, precision of manufacture is the primary requisite of our industry and is always held foremost to such secondary considerations as productivity, cost reduction, etc.

★ ★ ★

The physical, electrical and mechanical properties of the finished wire or strip are usually predetermined by the proficiency with which the alloys are melted. For example, successful production of heating element wire that will have a long life at high temperatures depends largely upon a clean, sound, workable ingot of precisely controlled composition.

★ ★ ★

In controlling composition account must be taken not only of workability, cleanliness and physical properties of the material, but also of the many more complicated and often difficult to measure properties such as resistivity, temperature coefficient of resistance, expansivity, oxidation resistance, emf against other metals, etc. A further complication results from the somewhat difficult behavior of many of the alloying ingredients such as chromium, titanium, zirconium, cobalt, beryllium, etc. Therefore, the high-frequency melting furnace is almost universally used to make these alloys.

★ ★ ★

The high frequency melting furnaces used in melting the resistance alloys have current ratings of 150kw and 330kw. The larger furnace is capable of melting about 2,000 lbs. The ingots cast from this furnace are approximately 300 lbs. A small amount of vacuum melting is also being done on an experimental basis.

★ ★ ★

It may be said that from the moment that the head Melter takes the last pyrometer reading of the melt and gives the signal to pour, the end results are achieved in the finished wire or strip only by ceaseless control and skill every step of the way.

★ ★ ★

Finger samples must be taken of each heat that is poured from the melt. These are chilled and sent to the Engineering Department where analyses are determined before further processing can be

done. Heats that are off analysis are scrapped, cut up and remelted because a melt that does not give the proper chemical analysis will not give the proper electrical resistance.

★ ★ ★

The 300 lb. ingot is reduced to a 2-3/8″ square through the 18″ mill. The bar is then ground overall and returned to the furnace for reheating. From here it is taken to the 12″ mill where it is partially reduced. Next, the bar passes to the 9″ mill where it is given nine passes through seven stands. It finishes on the floor coiler where it is taken up as a 125 lb. rod of 5/16″ diameter.

★ ★ ★

The reduction of the glowing red hot ingot to the billet in the Hot Mill is a precise task both in skill and physical energy. Close control and technical examination is expended here in an exhaustive search for imperfections that would corrupt the alloy. The mill is versatile in the fact that it can also be set up to roll flat strip. A portable hot roll coiler is set in place and a similar procedure is carried out for strip. These flats are used to supply the cold rolling mills.

★ ★ ★

Because it would be an overwhelming task to melt, Hot Roll and cold work these some fifty different alloys at a moment's notice, it is necessary to keep a sizeable stock pile of hot rolled rod and strip for future use. In order to insure against any mixing of the different alloys, a symbol designation has been instituted. For example, a letter or combination of letters are used as prefix symbols to the melt and heat number. These are arranged by grouping in order to separate the different types of alloys.

★ ★ ★

When the billet becomes hot rolled rod or strip these symbols or letter prefixes are stamped onto a metal tag along with the melt number. The cold mills make out a work card in addition to the tag. This work card will carry the processing information of the coil. At the point where the alloy becomes fine wire or strip a paper tag bearing this information is attached. These paper tags are in color and each alloy is thus separated to avoid any confusion.

★ ★ ★

Different alloys require different annealing temperatures and conditions. Alloys not requiring temperatures above 1600°F are annealed in the Westinghouse Bell furnaces. A Nitroneal-generator supplies these furnaces with an atmosphere of 90 parts nitrogen and 10 part hydrogen throughout the annealing cycle.

★ ★ ★

Alloys requiring a water quench after annealing can be annealed in either the Conveyor type furnace or the American Gas Batch Type furnaces. These atmospheres are controlled by the products of the combustion of gas which can be adjusted to either oxidizing or reducing depending upon the requirements of the alloy being processed.

The rod and wire cleaning house is a modern straight line installation. Two Cleveland Tramrail Gantry type cranes serve this system which is divided into twin pickling lines placed back to back. One side of the line is equipped for the processing of the nickel-chrome alloys. Starting with a storage rack of twelve hairpin hooks. Following in line are tanks containing the Virgo descale salt; water rinse; hydrochloric acid tank; nitric-hydrofluoric acid tank; and lead coating. On the opposite side of this dual line are facilities for deleading, bright dip cleaning, lime coating and a flash Baker.

★ ★ ★

Perhaps the placing of this pickle house on the inside of an open room was a venturesome move. Therefore, necessary precautions had to be taken to be absolutely certain that the ventilating system would effectively remove all fumes from the area. It has proven to be very effective in its operation. Pickling is a costly operation from the point of view of manpower, acid and material loss. It is only in recent years that it has been given the prominence in plant layout that it deserves.

★ ★ ★

The lead coated wire is drawn on a double deck bull block which can pull two holes per setup. Generally, the bull block will draw rod from 5/16″ to 200″. Continuous machines can draw from here; or the 20″ draw benches will draw to 128″ after which it is placed

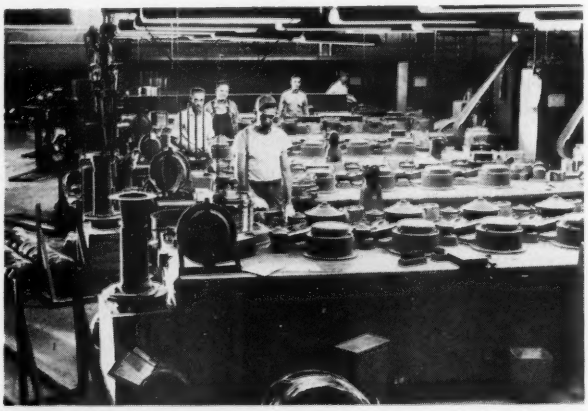

Figure No. 1—Continuous machines can draw from 200″ breakdown to .036″ breakdown at speeds up to 1,000 ft. per minute. * * * *

Figure No. 2—All drawing machines in the Fine Wire Department are of the continuous type. The drawing speed will vary as to the alloy being drawn. * * * * * * * * * * * * *

on high speed continuous drawing machines and drawn to .036". (See Figure 1) These high speed machines usually draw the lead coated wire at speeds of 1,000 ft. per minute. The number of intermediate anneals necessary to cold draw the 5/16" rod to .036" diameter will depend upon the type of alloy being drawn.

★ ★ ★

As our purpose in drawing heavy wire is only to obtain a supply of fine wire we have arbitrarily classified any wire below size .036" diameter as fine wire. In general, it can be said that all fine wire is diamond drawn wire.

★ ★ ★

You can see in Figure 2 a few of a battery of 36 Vaughn Ringblox machines. These machines are connected to a central circulating system that supplies each machine with sufficient oil drawing lubrication. This oil is constantly filtered and re-circulated through the system. High speed equipment such as this lends itself to the most effective use of operation manpower.

★ ★ ★

Wire is drawn on a production basis as fine as .0008" diameter. While most of the machines used for fine wire operations are modern, there are some machines of older design that still serve a useful purpose. However, all drawing machines in the Fine Wire Department are of the continuous type. This equipment will draw continuous through 8- 10- or 16 dies. The speed of drawing will vary as to the alloy that is being drawn. In general, the speed range will vary from 300 to 2,000 FPM. Factors that influence speed in this department would be characteristics of the alloy die, life, proper lubrication, etc.

★ ★ ★

The greater part of the fine wire is strand annealed and a small part of the heavy wire is also processed by this method. Strand annealing furnaces range in size from 3 ft. to 20 ft. in length. Each are equipped with a water cooled quench unit. Cracked ammonia consisting of 25 parts nitrogen and 75 parts hydrogen is circulated through the annealing tubes to prevent oxidation of the wire. The wire can be taken up either in coil or on a spool after passing through the furnace. One annealing furnace can handle from 10 to 40 strands of wire at a time. A strand anneal will give a brighter, cleaner wire. It also gives a close control of elongation or yield point requirements. As you can see, temperature of the furnace plus speed of travel through the furnace would be governed by the size of the wire.

★ ★ ★

Extreme care must be taken in all annealing operations. It is imperative that each alloy be treated according to its specific purpose so that the exact properties peculiar to the alloy are obtained. A customer will order to resistance; but he may also order to tensile, yield or elongation. He might also order a definite temperature coefficient between 0° and 100°C. In this case an alloy may require heat treatment to bring out these properties. This is the reason quantity production must come second to quality engineering. In other words, a precision instrument must have precision made components if it is going to perform a precision type job.

★ ★ ★

If one is going to produce wire that is drawn to close tolerances, it is necessary to produce dies made to close tolerances. For this purpose a large Die Room is maintained so that a variety of sizes can be stocked for immediate use. It is here that a shortage of proper size dies could deal a death blow to any production effort. Both tungsten-carbide nibs and diamond

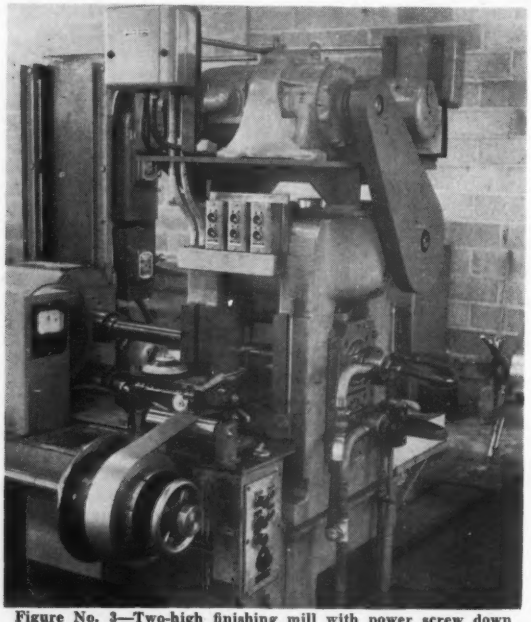

Figure No. 3—Two-high finishing mill with power screw down controls. The mill is equipped with a Pratt & Whitney swing micrometer for continuous gauging of strip. * * * *

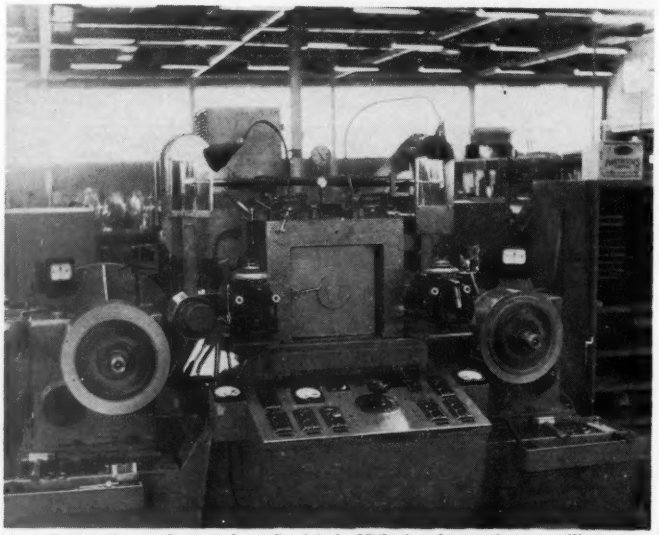

Figure No. 4—One of three Sendzimir Mills for the continuous rolling of strip. * * * * * * * * * * * *

dies are mounted and polished to the most exacting specifications practical for the production of precision wire.

★ ★ ★

Cold rolling of strip and fine rolling of flat wire are grouped together in a separate building. Figure 3 shows a picture of one of the conventional two-high mills used for processing 8″ strip. Development work is being done on the processing of 14″ strip. Here again as in the wire mill is the problem of rolling heavy sizes only for the purpose of obtaining fine size strip.

★ ★ ★

One of the more interesting conventional mills is a two-high finishing mill made by Waterbury Farrel. (See Figure 4) The rolls measure 8″ diameter by 8″ long and are water-cooled. The feature here is the power screw down equipment on the rolls. The arrangement is such that either side or both sides will screw down separately. This mill is equipped with a Pratt and Whitney swing micrometer for continuous gauging of the strip.

★ ★ ★

There are four wire flattening mills, one of which is a Schmitz variable speed control mill. These mills are all supplied with edge roll equipment and water cooled rolls. In general, they can roll round wire of 3/8″ to .095″ range.

★ ★ ★

Shown here are three Sendzimir mills. These mills will allow for a strip reduction from .060″ to .007″ thick with a single set-up and no intermediate anneals.

★ ★ ★

The large ZR-24 mill will handle a 14″width from a thickness of .135″ to .003″. The diameter of the work rolls range from .815″ to 1″. The speed range on this mill is from 0 to 300 FPM. This mill has an automatic coil stripper.

★ ★ ★

The ZR-16 intermediate mill can roll an 8-1/4″ width from a thickness of .072″ to .002″. The diameter of the work rolls range from .775″ to .860″. Strip can be rolled at a speed from 0 to 400 FPM depending on the alloy.

★ ★ ★

The ZR-15 or small mill can roll an 8″ width from .010″ to .00045″ thickness. The diameter of the work rolls range from .430″ to .500″. This mill will handle strip at a speed from 0 to 300 FPM.

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All three mills are equipped with the Pratt and Whitney micrometers for continuous gauging. Here also is employed the central circulating and filtering system for the lubrication and cooling of these mills. This type system definitely adds to the life of the oil.

★ ★ ★

As is true of the wire mill, it is also true of the rolling mill that all types of alloys must be processed on the available equipment. Therefore, when considering the purchase of a piece of equipment much thought must be given to its versatility. In other words, the same equipment must be able to process all types of stainless steel, high nickel, nickel-chrome, cobalt and copper base alloys.

★ ★ ★

The Fine Rolling Department processes round wire to flat wire or ribbon which demand close tolerances. These tolerances are maintained through the use of temperature control of the rolls. Through the use of single stand two-high mills the proper sizes can be determined without stopping the machines.

★ ★ ★

This department also employs a three stand tandem rolling mill. The mill is designed to operate with a constant tension at high speeds. The tension and speed is controlled by means of a Dynamatic clutch mounted alongside each stand. In this manner each separate stand can synchronize its speed in relation to the other rolls. Speeds of one thousand feet per minute have been maintained throughout the spool.

★ ★ ★

The rolls are surfaced with tungsten carbide which gives a long service life. Diameter of the roll is 4″ and 2-1/2″ in length. This mill is equipped with a heating and cooling system on the rolls. This is necessary to maintain close tolerances at high speeds.

★ ★ ★

Every spool and every coil of wire must be tested before shipment to be certain that it meets the full requirements of the customer. The organizational setup for this department is unusual in that it reports directly to the Sales Department. In this way they represent the customer. Therefore, any questions about the material meeting the customer's requirements usually means rejection for reprocessing.

★ ★ ★

This industry is usually judged by its failures rather than its success and, as a consequence, it cannot afford to permit a single spool of material to reach the customer that does not meet his fullest expectations.

★ ★ ★

As you would suspect, much of the very fine wire is sold to the resistor manufacturers where it is wound on small bobbins to certain ohm resistances. As each turn of wire must be insulated from another, it is imperative that this type of wire should be insulated to withstand a 300 volt dielectric test. Therefore, a service is performed to the customer by insulating the wire with such materials as: enamel, silicone, nylon and Formvar. This Insulating Department also is equipped to wrap the wire with such yarns as: silk, nylon, cotton and fibre glass. It is also possible to do a limited amount of polyvinyl plastic extrusions.

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In order to get an overall picture of the problems that are encountered in the "Fabrication of Electrical Resistance Alloys" it has been necessary for me to cover a great deal of ground in a comparatively short time. Rather than dwell too long on a specific point,

(*Please turn to page* 726)

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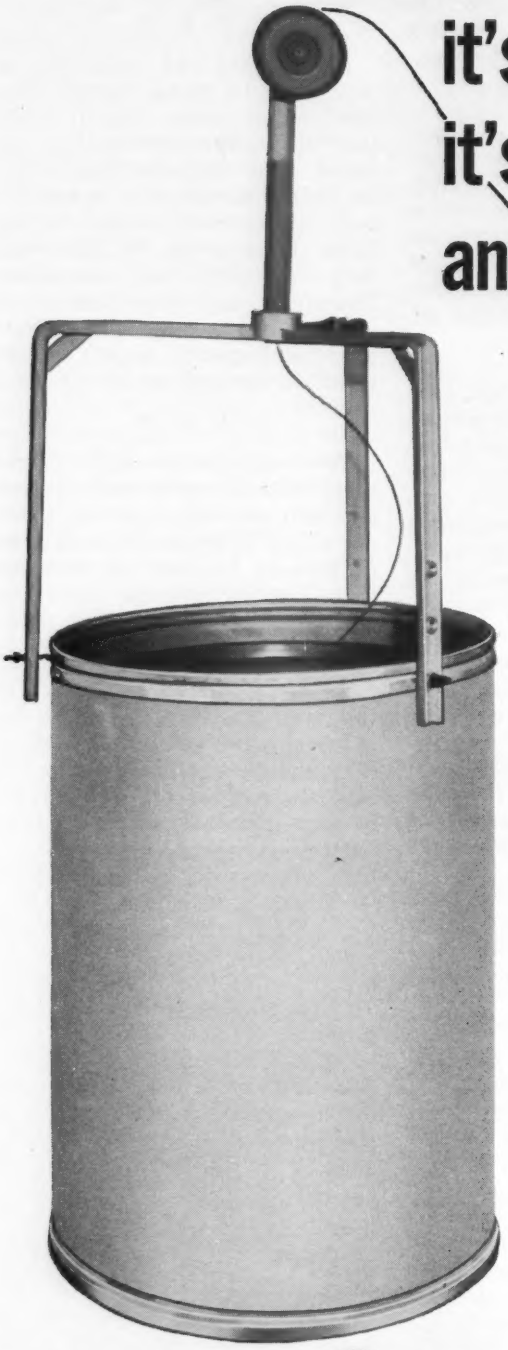

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World Supply and Price of Copper

by Bernard Aronson, President
Spencer Wire Corporation
Union, New Jersey

Man's oldest and most useful metal is copper. It was discovered by a half savage tribe on the Island of Cyprus in the Mediterranean; the time was perhaps centuries before history was transcribed. These islanders called it Cyprian metal, which name it has kept through the ages although our tongues have changed the word to Copper.

★ ★ ★

It was used by the early Egyptians for weapons, by the Renaissance Italians for works of art, by Paul Revere who was first to roll sheet copper in this country and by Thomas Alva Edison who, by producing the first incandescent lamp, put copper into large scale practical use because of its efficiency as a conductor of electricity.

★ ★ ★

Some veins of copper bearing ore are found thousands of feet below the earth's surface and such ore is recovered by underground deep shaft mining. Other deposits of copper are found close to the surface; these are mined by the open pit methods so successful in parts of the United States.

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Copper bearing ore is treated in various ways to separate the copper from the other metals, depending on the type of ore and the desired purity. Generally, the processes are complicated and time consuming as the ore is moved from mine to crushing plant, to concentrating mill, to smelter, to converter, to refinery.

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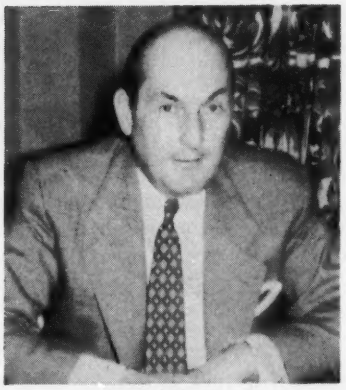
There is no need here to go into the detail of these manufacturing processes. Suffice it to say that Electrolytic Copper which is used in the manufacture of wire and cable is processed in special refineries where the copper is cast into anodes which are suspended in tanks of copper sulfate and sulfuric acid. By the use of electric current these anodes are gradually dissolved and the copper is redeposited on a series of plates called cathodes which are then 99.43% pure copper. The cathodes are remelted into wire bars, the wire bars are hot rolled into rod and eventually drawn into the required gauges of wire where it is again annealed for flexibility before ultimate use as a conductor.



Bernard Aronson

The author graduated from Cornell University in 1927 with an A.B. degree. He attended the Cornell Law School in 1928 and entered the investment banking business in 1930, becoming a member of the New York Stock Exchange in 1932. After serving in the Armed Forces from 1942 to 1946, emerging as a Col. U.S.A.A.F., he returned to business life. He became President of Spencer in 1948. This paper was read before the New York Regional Meeting of The Wire Association on April 28, 1955.

★ ★ ★

The world's chief sources of copper ore are the United States, Chile, Rhodesia, Belgian Congo, Canada, Peru, Mexico and Spain. Let's look at the supply in the most important areas, beginning with

The United States

Talking about "normal supply" or "a typical year" for purposes of determining average copper production in this country is phraseology of the past. World tensions, population growths, threatened wars and police actions, possibilities of Governmental allocations, stockpiling policies, labor unrest, recession and depression talk — these have all contributed to make copper supply and demand a subject to be studied weekly, even daily. We need, therefore, to review only a year or two to bring ourselves up to date: we need to look forward no more than a year or two to make some educated guesses and prognostications as to the future.

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In 1953 mine output and secondary intake at smelters and refiners was 1,067,000 tons.

★ ★ ★

In 1954 mine output and secondary intake was 943,000 tons — or 124,000 tons less than the previous year.

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Our net imports (imports over exports) in 1953 were 558,000 tons. In 1954 it was 360,000 tons—or 200,000 tons less.

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Thus the smaller domestic output and the smaller net imports of 1954 represent a total loss to the United States of about 317,000 tons from the 1953 level.

★ ★ ★

Consumption, it is true, dropped in 1954 to 1,235,000 tons against 1,375,000 tons in 1953; but this drop of 140,000 tons by no means wipes out the 317,000 ton deficit caused by loss of output and loss of net imports between those two years.

★ ★ ★

This decrease in copper available to the United States has continued

on into early 1955. What are the reasons?

★ ★ ★

In the first place we lost about 60,000 tons of production in 1954 due to crippling strikes at nearly all major mines, smelters and refineries, only part of which was compensated by deferments in deliveries to the national stockpile.

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Secondly, and especially as far as net imports in the latter part of 1954 and early 1955 are concerned, the prices paid abroad were higher than in the United States, and copper, quite naturally, flows to the highest bidder in a world market. This price situation was accentuated not only by the lowering of domestic production early in the year but was further aggravated by consequent lowering of scrap production as well. Refineries which had to pay higher prices for scrap were forced by economics to seek higher priced world markets for their finished product. We shall take up price consideration later in this paper.

★ ★ ★

Thirdly, and perhaps most important, is the fact that in the early part of 1954 nearly everyone was talking about a slide in the volume of business. This talk ranged from estimates of a 1932 type depression to a slight three percent (3%) recession in business volume. This talk caused almost everyone in the copper business to "pull in the horns," cut inventories, "live off the fat" and order less. This in turn created a situation in which producers began to predict an oversupply of metal; they cut their working schedules in the mines from seven (7) days to six (6) and then from six (6) days to five (5). Copper users began to look over their order books and found their backlogs dwindling. Brass mills found themselves in the same situation as copper wire mills. Some price cutting began. The spiral had begun and moved slowly downward until almost mid-year, when it was suddenly discovered that business wasn't half as bad as had been predicted. By then it was too late for producers to make up the deficiencies in their early 1954 production.

★ ★ ★

A fourth factor also entered the early 1954 picture. That factor was the pile up of 180,000 tons of copper in Chile. Unsold and unwanted because the Chileans did not wish to sell it below the thirty-six cents (36c) to which they had become accustomed before our controls were lifted in 1953, it hung over the United States producers' heads like the Sword of Damocles—a threat to stability. We shall also discuss this situation when we later discuss price.

★ ★ ★

All the above factors lead to the present shortage in supply. Relief by deferments of deliveries to stockpile are not enough to change the situation in relation to the present demand. Other Governmental actions like embargoes on scrap and refinery shapes are likewise not enough to take care of the urgent demand created by the biggest building boom in history, the tremendously stepped up production of automobiles (45 to 75 lbs. per car), the advent of an air conditioner on almost every window, the large scale of ship building, and the natural increase in demand for copper products which goes with an increase in population.

★ ★ ★

At this writing, the only 1955 figures published are for January and February. In those months consumption of refined copper by fabricators was at the highest average level since the Korean War. It averaged 127,500 tons against a monthly average of about 100,000 tons for all of 1954. Intake figures averaged 111,000 tons, thus indicating an excess of consumption over intake which averaged 17,000 tons for the two months. While this rate probably is exaggerated and will not continue, it certainly gives a clue to early 1955. Monthly consumption is probably running at the rate of 115,000 to 120,000 tons per month. Domestic monthly production is running at the rate of about 97,000 tons per month, less about 5,000 tons which goes to the stockpile. Thus we have a deficit of about 25,000 tons per month which must come from foreign producers to keep the American fabricator and consumer supplied but which copper simply isn't arriving because of the price differential abroad.

★ ★ ★

On the other side of the picture, there were either opened in 1954 and early 1955 or expected to open later in 1955 and early 1956, a total of about ten (10) additional major new mines in Arizona, Nevada, Michigan and Montana. All new mines are expected to have a total net production of about 250,000 tons per annum or a monthly total of about 21,000 tons when in full production. You, who run wire mills, know that "bugs" can develop in new facilities but gradually this production should make itself felt in an increased supply.

★ ★ ★

The psychology of demand must be considered when talking about the quantity of the supply available to the average copper user. Shortage talk in and of itself creates excess demand, just as recession talk in and of itself creates subnormal demand. Thus we have at the present time an abnormal demand which is automatically self-feeding, and this has almost reached the point of hoarding. This abnormal demand, I have a hunch, is also being fed in a big way by demand from behind The Iron Curtain. Somehow the world's copper must be getting into Russia and its satellites, even if via the back door. British exports of copper products are running about 13,000,000 lbs. per month compared with an average of 7,000,000 lbs. per month in 1953.

★ ★ ★

The Last In-First Out method of accounting used by many large fabricators and producers has also been responsible for their attempt to keep their own copper inventories at a high level. These firms must keep heavy copper stocks at the ends of their fiscal years so as to take advantage of favorable inventory pricing for tax purposes. This demand was particularly no-

ticeable at the end of 1954, and kept much copper from reaching consumers at the very time when these consumers' stocks were depleted because of the labor strikes in the Fall.

★ ★ ★

For the future, one of the great elements of danger to the copper supply is the lack of venture capital going into the metal mining field, except for the glamour metals like uranium. High costs, lower grade ores and inadequate returns for the risks involved keep the investor's venture capital locked in his pockets or invested elsewhere, where the odds are better. While domestic metal mine investment in the 1950-54 period was abnormally high due to the Korean conflict, it increased only seventy-five percent (75%) compared to a one hundred seven percent (107%) increase in foreign metal mine investment. While total American metal mine investment today is estimated at about Three and one-half (3½) Billions, American investment in mines abroad has risen to over Two (2) Billions. Foreign mines attract the capital because of relatively lower labor costs, relatively higher grade, large tonnage ores, and the ready availability of a good world market.

★ ★ ★

Smaller mines in this country ofttimes do not have the funds to fully develop their properties or even to fully survey their claims. If these small mines do not have the money to survive periods of depressed metal prices, they "high grade" their ores — take out only high metal containing ores and leave the low grade, instead of averaging out both. This process causes depletion long before necessary and is economically wasteful. It usually leaves mines in such condition that no one later wants to pick up and continue, even if they have the money.

★ ★ ★

It has been estimated that the entire mining industry in 1953 spent no more than $15,000,000 for metal exploration. Compare this with the $1,400,000,000 spent by the petroleum industry in the same year searching for oil.

★ ★ ★

The present method of Government subsidy for the copper mining industry as a means of guaranteeing the miner a certain price for his finished product is a definite step in the right direction. It should be expanded many, many times. Further tax benefits for the individual entrepreneur in the mining field would be a further help. Technological improvements in the method for mining low-grade ores would also assist in increasing the domestic supply of this popular metal. In fact every known method for increasing the supply of copper domestically should be attempted, to make this country self-sustaining. No stone should be left unturned to develop copper mining both in this country and elsewhere in this hemisphere.

★ ★ ★

Below is a chart giving a list of new mining projects, most of which are in this country, and which are operating or expect to operate under a United States Government floor price guarantee.

NEW MINES WITH FLOOR PRICE GUARANTEES

Mine	Production to start	Approximate expected Production (in thousands of short tons) 1954	1955	1956	1957
YERINGTON	Nov. 1953	28	33	33	33
WHITE PINE	Early 1955	5	35	45	45
OSCEOLA	1955		5	8	8
SILVER BELL	May, 1954	12	18	18	18
CAMPBELL-CHIBOUGAMU	May, 1955		9½	18½	4
SAM MANUEL	July, 1956			20	70
COPPER CITIES	Late, 1954	6	22½	22½	22½
LAVENDER PIT	Fall, 1954	18	38	38	18½
FALCONBRIDGE-MILNET	Part, 1954	5½	3	3	3
	TOTALS	74½	163	206	222

Chile

Chile's copper comes mostly from the Chuquicamata and Potrerillos Mines owned by subsidiaries of Anaconda, and from the EI Teniente mine operated by Kennecott. For 1952, 1953 and 1954 these mines together produced an average of 348,000 metric tons per annum. Yet in 1954 production was less than 325,000 metric tons, or less than the three (3) year average. Chilean owned mines, in addition, produced about 36,000 metric tons in 1954.

★ ★ ★

It is quite usual for the Chilean optimists to predict a production of between 450,000 to 500,000 metric tons in 1955. The realization of even the lower of these estimates would greatly relieve the tight world supply picture, but alas! it just won't happen, because:

a. **Labor is headed by radical and left-wing elements which continually demand wage increases of many times what the companies could afford, even though Chilean mine wages are high compared to other wages in Chile, and**

b. **These demands are not only unreasonable but unconscionable and many minor strikes and slowdowns are caused by these leaders for a "show of strength", "solidarity" and "political reasons". These slowdowns and petty strikes come all during the year and are in addition to the big annual strikes; to wit: the one day walkout in March, 1955.**

c. **The big strikes always last longer than necessary because the normal counter-offers to increase pay look so tiny when compared to these fantastic demands, and**

d. **The Kennecott mine has water shortage problems almost regularly, while the Anaconda mines have mechanical problems almost as regularly.**

★ ★ ★

The recession talk in the United States in early 1954 magnified itself in transmittal to Chile whose fears were that trouble in The United States would mean trouble in the rest of the world as well. Production was cut back for the first half of 1954 at all Chilean mines.

★ ★ ★

In August, 1954, EI Teniente was struck with a demand the equivalent of six cents (6c) per lb. in increased cost. In September, 1954, the Anaconda mines were also struck in sympathy and as a matter of course, added a few demands of their own. While the Government stepped in by threatening Army service to those men who did not continue working, the campaign was nullified by the simple expedient of the men simply moving to other parts of Chile. About 18,000 tons of production were lost in these strikes.

★ ★ ★

With unstable labor and unstable politics, with no sense of loyalty or obligation to its best customer, the United States, Chile cannot be counted upon to increase its production or even to sell the major portion of it to the United States unless it can receive higher prices here then elsewhere. Price, which is discussed below, is the ruling factor. One figure might be mentioned here. Between January and February 19th of this year, the Chilean Central Bank sold about 38,000 tons in Europe vs. 23,000 tons received in the United States, this despite our shortage and our normal use of the greatest portion of their copper.

★ ★ ★

In 1944 Chile produced 490,000 tons. In 1954 Chile produced 325,000 tons. In my opinion its problems are unsolvable. Its leaders can not control the unions and the union leaders seem only interested in themselves, the national economy of Chile being secondary, indeed, if considered at all; and Chile needs copper exports to dollar countries to live.

★ ★ ★

What 1955 has in store for Chilean copper mining is something I would not at this moment dare to predict.

ESTIMATE OF FREE WORLD POSITION
(In Thousands of Tons)

	1954	1955	1956	1957
SUPPLY(1):				
USA Production, Primary & Secondary	943	1200	1220	1260
Foreign Production, Primary & Secondary	1825	1968	2002	2076(2)
FREE WORLD PRODUCTION	2768	3168	3222	3336
Less Commitment to U.S.Stockpile(3) plus Blister to Sulphate(4)	-227	-143	- 90	- 98
AVAILABLE TO CONSUMERS	2541	3025	3132	3238
CONSUMPTION:				
U.S.A.	1207	1380	1390	1400
Foreign	1532	1605	1625	1645
TOTAL	2739	2985	3015	3045
NET FREE WORLD SURPLUS or DEFICIT:	-198	+ 40	+117	+193
INCREASE OVER 1954:		+238	+315	+391

(Note: This chart refers to text on page 714)

(1) No allowance for strikes or other voluntary curtailments.

(2) This figure does not include a possible 45,000 tons which could come into the supply from The Majdanpek Mine, in Yugoslavia. This mine has a wealth of copper but the opening of it has been delayed year after year.

(3) These are only the definite commitments. If the price should fall, there are contingent possible deliveries of about 200,000 tons per year.

(4) This represents about 40,000 tons annually made into copper sulphate, hence deducted.

Peru

In passing we might comment that to the south of Chile, in Peru, four (4) large North American companies under American Smelting and Refining Company sponsorship, have started a long range mining development program at Toquepala, in a deal jointly arranged by the Peruvian Government and Export-Import Bank. Given the time necessary to put these mines in operation, 140,000 tons per annum are envisaged by the sponsors, a great addition to the world supply.

South Africa

In South Africa there is a large supply of copper metal being regularly mined and shipped, mostly to European fabricators with a growing amount coming to the United States before the recent price rise on the London Metal Exchange. In 1954 the total production for Rhodesia, the Belgian Congo and other parts of Africa was 733,000 tons.

★ ★ ★

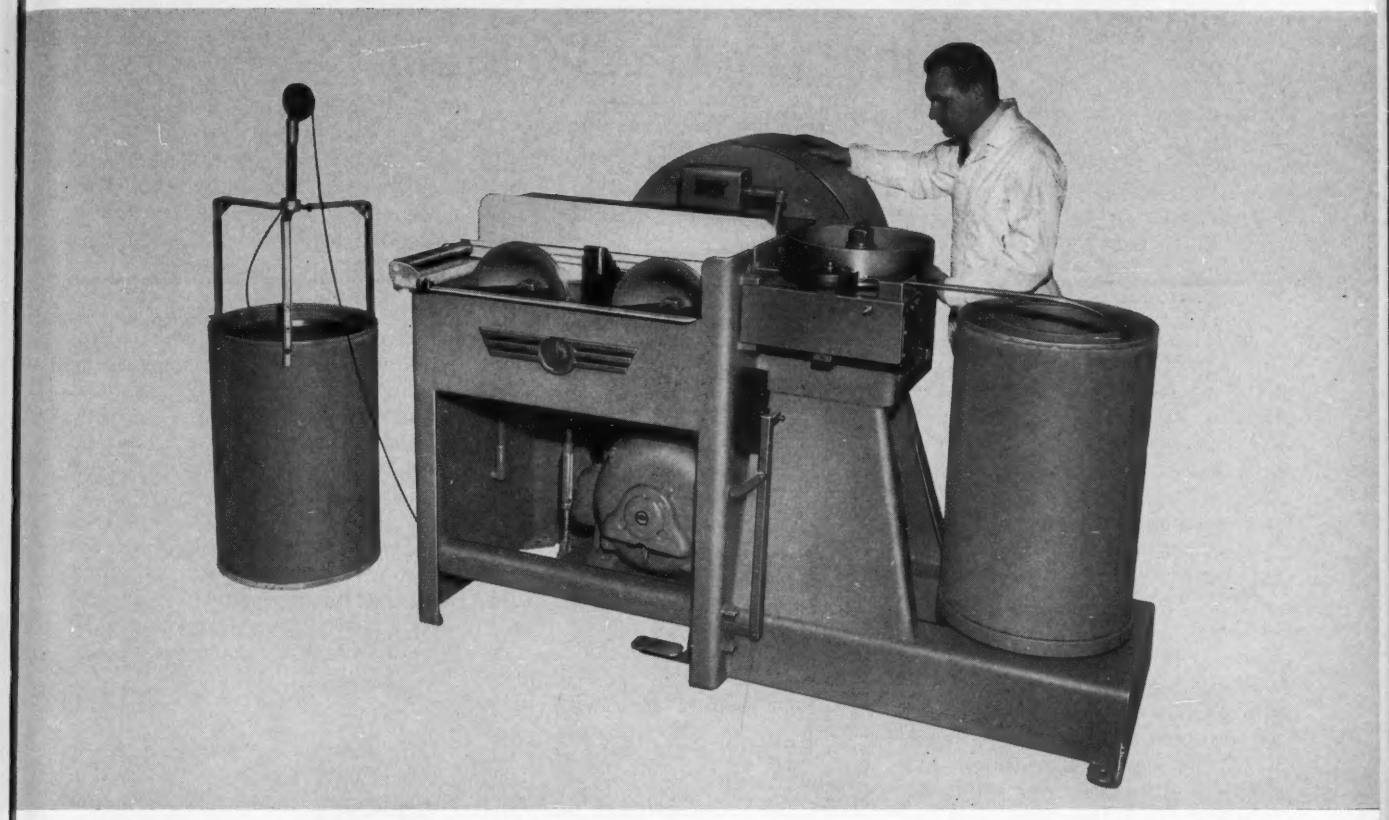
In Northern Rhodesia where most of the mines are English owned, the labor picture is truly beginning to darken, and by that I mean race difficulties are becoming more and more noticeable. In this section of Africa where 1954 production was 454,000 tons, a strike broke out on January 3rd of this year and did not end until March 3rd, causing an estimated production loss of at least 50,000 tons. Most of the difficulty stems from different rates paid black and white workers. And the reasonable expectation is, unfortunately, that this will continue.

★ ★ ★

The mines in South Africa are truly one of the great hopes of the

(*Please turn to page* 714)

Coulter & McKenzie **DRAW·PAK** *Equipment*



Model 116—Continuous Fine Wire Drawing and Packaging Machine

Continuous Drawing & Packaging Machine Yields HIGHER EFFICIENCY in fine wires!

Sustained higher efficiency is being realized in fine wire production using banks of five or six Coulter & McKenzie Model 116 machines. Each machine will continuously draw and package a 500 to 750 pound wire at a rate up to 1500 feet per minute.

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THE COULTER & McKENZIE MACHINE CO., INC.

Repair of Thermoplastic Cable Jackets Using Hot Gas Welding

by Ross A. Pringle, Chief Engineer, and
Andrew D. Varenelli, Chief Chemist
The Ansonia Wire and Cable Company
Ansonia, Connecticut

This paper was delivered on April 28, 1955, at the New York Regional Meeting of The Wire Association. It was followed by a sound motion picture to portray graphically the processes discussed in the paper.

In the wire and cable industry a cable can be damaged while being manufactured, during installation, or when it is in operation. Defects in a cable jacket can be the cause of serious operational difficulties. Customers pay for, and have every right to expect, a cable jacket which is homogeneous and free of splits, holes, cuts or blisters. We shall discuss the repair of defects which occur in manufacturing.

★ ★ ★

Since the perfect manufacturing process has not yet been realized, we do occasionally find a cable which is damaged through mechanical difficulties or improper handling. It is possible with hot gas welding to repair and save many thermo-plastic jackets which formerly had to be stripped and rejacketed at considerable loss of time and material. In some instances, stripping is impossible and a defect in the jacket formerly meant scrapping a whole length of cable. A thermoplastic repair properly made with hot gas welding is perfectly satisfactory for the following reasons:

1. **It is made with the same material as the parent jacket.**
2. **A section repaired by welding is generally stronger than the original jacket because it is thicker.**
3. **With practice, a repair can be made by welding which has an acceptable appearance.**
4. **If the repaired area must be of the same thickness as the jacket, it will have about 90% of the original jacket strength.**

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The technique of hot gas welding is not new. Application for a patent "Method of Welding Thermoplastic Materials" was made by R. C. Reinhardt in 1937 (1). This was granted in 1940 and assigned to the Dow Chemical Company. At about the same time gas welding of polyvinyl chloride was developed in Germany. Application for a German patent was made in 1938 (2) which was granted to Henning of the I.G. Farbenindustrie. Reinhardt's and Henning's methods were practically identical. Because of the relative poor quality of the early polyvinyl chloride materials available in this country, hot gas welding met with little success and the process was abandoned. The necessity of using thermoplastics, particularly plasticized and unplasticized polyvinyl chloride during World War II caused the Germans to devote more effort to the development of hot gas welding. Consequently most of the early developments of the technique were made in Germany. The feasibility of using such a process was recognized by our Company at an early date.

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Since thermoplastics can be softened and caused to coalesce by the application of controlled heat and pressure, and because they regain their rigidity when cooled, they can be welded. The technique of thermoplastic welding is similar to the brazing of metals, the principle difference being that the plastic welding rod does not flow as molten metal, but must be laid in place under pressure. In metal brazing complete fusion of the brazing rod and parent material occurs. With thermoplastics a bond is made between the welding material and the surface of the parent material, since only these mating surfaces are heated to the melting point.

The preparation of thermoplastics for welding is similar to that for brazing, soldering, or welding of metals; namely, the surfaces must be clean and free of dirt, grease or other foreign matter. Mechanical cleaning using either a file, wire brush or emery cloth is generally used and is preferred to solvent cleaning. Should solvent cleaning be necessary, care must be taken to avoid getting solvent inside the cable and to remove all traces from the surface.

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Many types of welds such as butt, corner, edge, fillet, lap and strip can be made when welding thermoplastics. Single V-butt and strip welds are generally used for repairing cable jackets. The type used will depend upon the nature of the damage and/or the thickness of the jacket. On a thick jacket, a single V-butt weld is usually used. If the jacket is relatively thin, a strip weld may be more desirable.

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The only materials needed for repairing a thermoplastic cable jacket by hot gas welding are filler rod and either molded or calendered strips. These materials should have essentially the same composition as the cable jacket to be repaired. The filler rod should be round rather than square or rectangular for more uniform heating. The sizes of the rod required will vary from 1/8″ to 1/4″ in diameter depending upon the repair to be made. Tools to be used include any one of several commercially available welding guns for supplying hot gas, a sharp knife, and a round metal rod.

One type of an electrically heated torch is shown in Figure 1. This unit has a 450 watt, 115 volt enclosed heating cartridge fitted into a spirally formed helix. The gas makes three spiral passes the entire length of the heater before being emitted through the nozzle. The maximum operating temperature obtainable with this torch is 700°F. The required operating temperature is obtained with this gun by adjusting the voltage and gas pressure applied to it. A powerstat and pressure regulator are provided for this purpose. The powerstat is rated at 7-1/2 Amp, 115 Volt, 60 Cycle, and is adjustable between 0 and 115 Volts. The pressure regulator will operate from pressures up to 300 psi and deliver pressures from 5 to 60 psi. Figure 1 illustrates a straight nozzle. However, 45° nozzles are obtainable if preferred. Figure 2 shows the relationship between voltage and pressure to temperature of the hot gas jet 1/4" from the nozzle when compressed air is used.

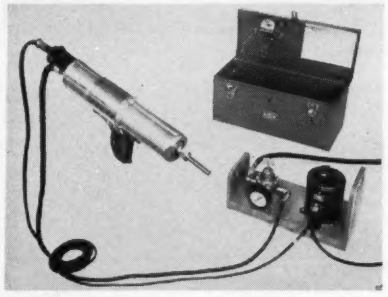

Figure 1.

Another type of electrically heated torch is illustrated in Figure 3. This model employs spirally wound exposed nichrome wire positioned in ten holes running the length of a ceramic insulator. The welding gas passes through these holes over the nichrome wire and out through the nozzle in a single pass. The heater cartridge in this unit can be readily replaced within a few minutes, while the unit illustrated in Figure 1 must be returned to the manufacturer for replacement. It will also be noted that the handle of the torch in Figure 3 is in line with the nozzle; the advantage or disadvantage of this being a matter of personal choice. The operation of both of these torches is similar with the exception that a flow meter calibrated from 10 to 90 cu. ft./hr. is used to regulate the gas supplied to the latter instead of a pressure gauge. Either method of measuring gas pressure is satisfactory, but the flow meter is more practical where a cylinder of gas is used since a direct relationship exists between the meter setting and the gas consumed. By knowing the rate of flow of gas, the operator can estimate the time that will elapse in expending a full or part cylinder. Figure 3 also shows a unit for checking the temperature of the welding gas. A small mercury thermometer is mounted on the control panel. An air stream guide directs the hot gas onto the bulb of the thermometer maintaining a distance of 1/4" between the tip of the nozzle and the thermometer bulb.

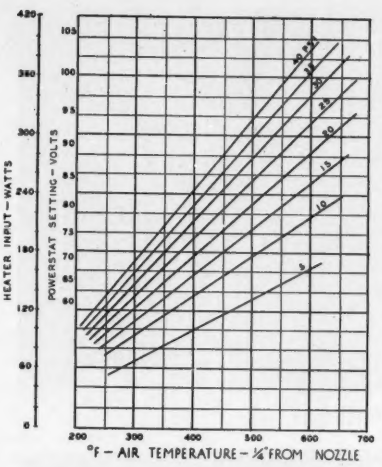

Figure 2.

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Gas heated welding torches are available in two types; acetylene heated and propane heated. Figure 4 illustrates a propane operated unit. In this type torch the welding gas is heated by an open flame as it passes through an enclosed spiral tube. The desired temperature is obtained by regulating the pressures of both the welding and heating gases.

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Electrically heated torches of the type shown in Figure 1 can be used in confined areas without risk of explosion or emission of irritating fumes. Electrically heated guns shown in Figure 2 cannot be used in manholes, but have the advantage of easy cartridge replacement. Gas heated torches, on the other hand, are lighter in weight and require no power supply for their operation.

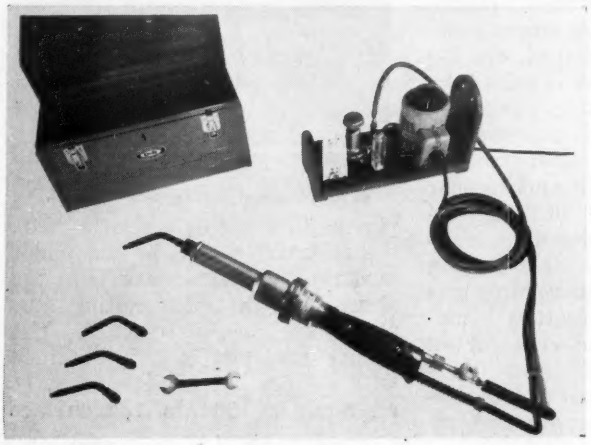

Figure 3.

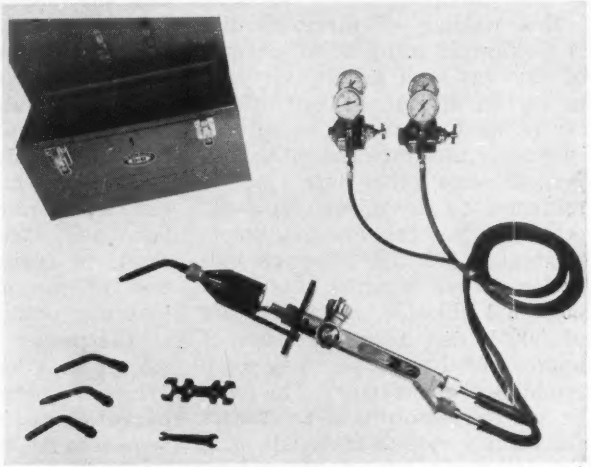

Figure 4.

Figure 5.

Figure 6.

Figure 7.

Figure 8.

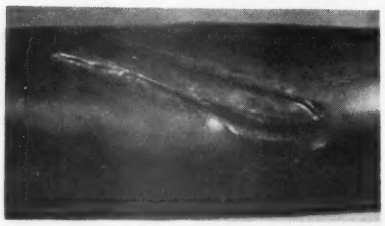

Figure 9.

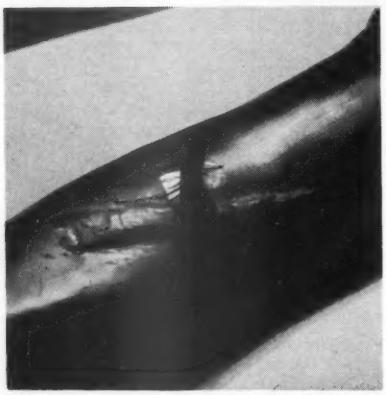

Figure 10.

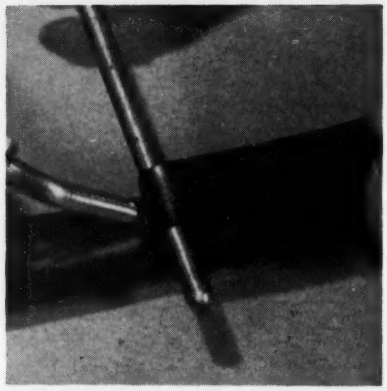

Figure 11.

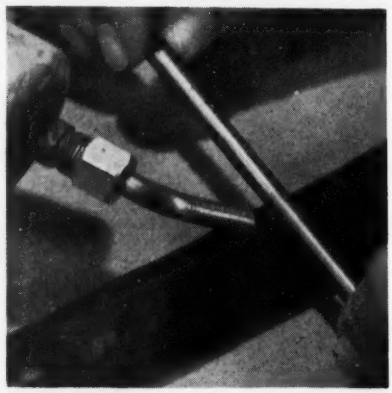

Figure 12.

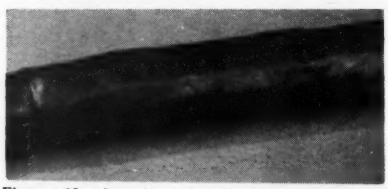

Figure 13.

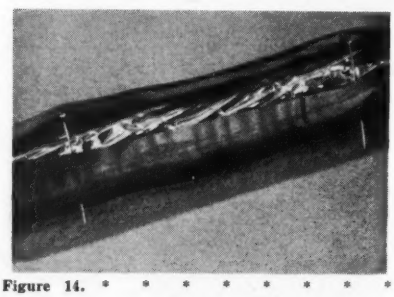

Figure 14.

Although the following comments and discussion of technique apply specifically to our own experience with plasticized polyvinyl chloride, the majority of conditions also apply to other thermoplastics such as polyethylene.

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Gas welding of thermoplastics is performed using a hot stream of dry gas such as air, nitrogen or carbon dioxide. If compressed air is used, it should be filtered to remove moisture and oil. Nitrogen or some other inert gas is preferred to air for welding polyethylene since this material deteriorates considerably through oxidation. When welding plasticized polyvinyl chloride, a temperature of 500°F and a gas pressure of approximately 20 psi has been found most satisfactory. The proper gas temperature and pressure for welding various materials must be determined from experience. These conditions should be such that the blast of welding gas will not distort the softened plastic excessively. After the proper pressure has been established, the desired temperature is obtained by regulating the heating power input. The welding gas temperature must be closely controlled since insufficient heating will cause a poor bond and excessive heating will result in burning and decomposition of the plastic. Overheating may also occur when welding gas at the proper temperature is impinged on a localized area for an excessive period of time. Overheated or underheated welded sections should be cut out and remade.

When welding with either a plastic filler rod or a plastic strip, the material should be fed under moderate constant pressure at the same rate that the mating surfaces are being softened. The proper pressure is best obtained with a filler rod by holding it at an angle of 90° to the surface

(*Please turn to page* 712)

Hot Dip Galvanizing Is A Science

by Wallace G. Imhoff, President
The Wallace G. Imhoff Company
Van Nuys, California

Part V

In this part of his series, the author discusses the principle that the faster the withdrawal time, the heavier will be the zinc deposited as a galvanized coating, for if the withdrawal time is slower than an allowable minimum, an alloying process sets in and the weight of the zinc coating increases in proportion to the time that the article remains in the molten zinc bath.

One of the main purposes of setting forth the basic scientific principles of hot dip galvanizing, is to reveal how zinc can be saved in practical operations, while at the same time, an article of higher quality is made using less zinc. This of course then means that the cost of galvanizing is at a minimum. It has been discovered that just in proportion as the scientific principles of galvanizing are violated, galvanizing costs increase. Zinc used for coating purposes, and zinc lost in the dross and other by-products, usually are the determining factors in creating high or low costs. Rolls in sheet galvanizing and wipes in wire galvanizing, or any kind of artificial tampering with the free flow of the metal run-off of zinc, of course, interferes with the operation and results obtained. The coating weight, finish and quality also are affected by not permitting the galvanizing principles to operate freely.

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In order to determine the exact relation between the withdrawal time, and the weight of zinc deposited as galvanized coating, a research investigation was made as follows:—

Purpose

The object of this experimental work was to ascertain the relation between the drawing time of the article galvanized and the weight of the zinc deposited as galvanized coating.

Method of Procedure

Ten 6 x 6 inch blackplate 28-gage sample sheets were used for the experiments. Each sheet was pickled clean before being galvanized. The time of submersion in the zinc bath was 20 seconds in each case. The drawing time was the time consumed from the moment the piece started out of the bath, until it was withdrawn completely out of the zinc. All samples received the same treatment up to the drawing time.

Results

The investigation demonstrated clearly that (1) the quicker the sheet is drawn out, the heavier the zinc coating will be; (2) the lightest deposit is made when the drawing time is about 15 seconds; (3) from 15 seconds to 60 seconds is the best drawing time from the standpoint of the amount of zinc deposited; and (4) when the drawing time is over 60 seconds or under 15 seconds, the weight of zinc coating deposited increases rapidly.

Note

The sheets were drawn diagonally. The drawing time is, therefore based on the 8-1/2 inch diagonal. (See Experimental Data table below)

Recommendations

From the above experimental work the ideal drawing time seems to be about 3 feet a minute (8-1/2 inches in 15 seconds). The slowest drawing time should not be less than 8-1/2 inches a minute. The drawing time should be within these two figures to obtain the lightest zinc coating. If the piece is drawn faster than 3 feet a minute, or slower than 8-1/2 inches a minute, excess zinc will be deposited.

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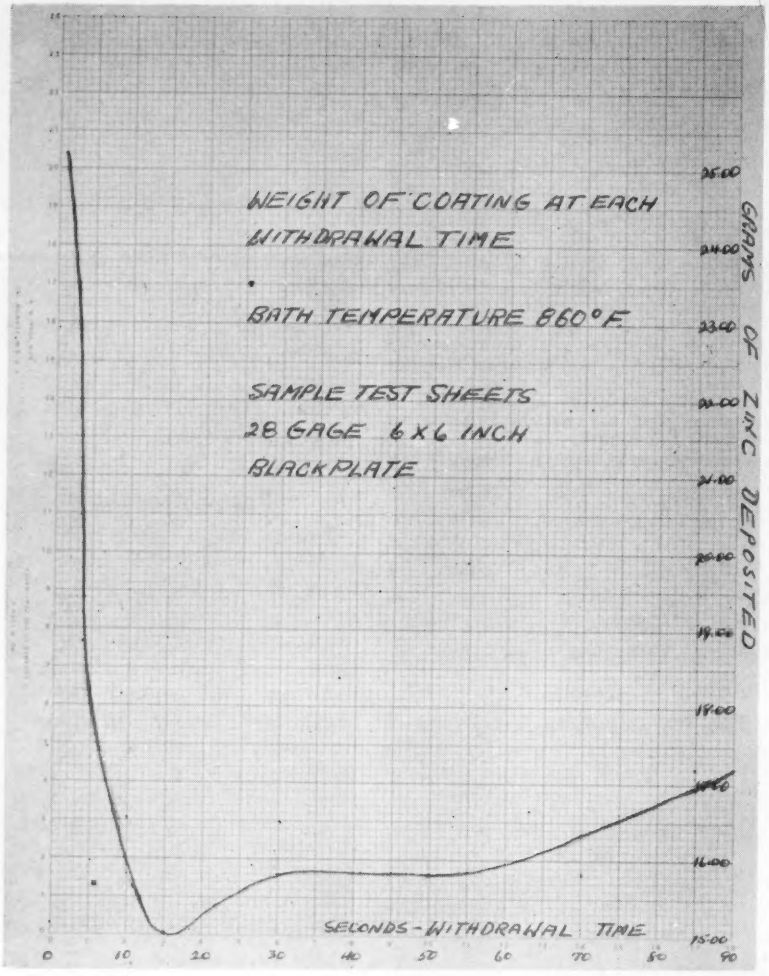
This part of the graph illustrates very clearly why it is most economical, from the standpoint of weight of zinc deposited as coating, to use this withdrawal-time range. The metal deposited rapid-

EXPERIMENTAL DATA

	Time of Submersion	Drawing Time	Total Time	Zinc Deposited
1.	20 Seconds	1 Second	21 Seconds	25.20 Grams
2.	" "	3 Seconds	23 "	23.50 "
3.	" "	4 "	24 "	19.40 "
4.	" "	5 "	25 "	18.20 "
5.	" "	8 "	28 "	16.70 "
6.	" "	10 "	30 "	16.50 "
7.	" "	15 "	35 "	15.00 "
8.	" "	30 "	50 "	15.80 "
9.	" "	50 "	70 "	15.80 "
10.	" "	90 "	110 "	17.20 "



ly increases when the withdrawal-time is less than 15 seconds, and more slowly, beyond 60 seconds, at which time the weight increases due to the alloying action of the zinc bath with the iron of the sheet.

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A second test was made to verify the results obtained from the laboratory experiments just given. The purpose of repeating the tests is to demonstrate conclusively that the same scientific principle operates under practical plant routine galvanizing practice, that has been found to operate on a small laboratory basis. The following data has therefore been obtained under actual plant operating conditions.

Method of Procedure

Pails, Water—Regular Grade, were used in carrying out this experiment. Six lots of 100 each were galvanized under identically the same conditions, the only feature of difference being in the time of withdrawal from the galvanizing bath. The withdrawal times were 0.50 minute, 0.25 minute, 0.17 minute, 0.13 minute, 0.10 minute, and 0.05 minute.

PAIL, WATER; REGULAR GRADE

Withdrawal Time Tests

Lot Number	1	2	3	4	5	6
Started	7:50	8:53	9:53	9:05	9:38	10:07
Stopped	8:51	9:48	10:26	9:32	10:07	10:33
Time	61	50	33	26	29	26
Rest Period	0	7	5	0	6	0
Quantity To Flux Box	100	100	100	100	100	100
Through Flux		Same time for all lots.				
Submersion Time		" " " " "				
WITHDRAWAL TIME	.50	.25	.17	.13	.10	.05
To Pile		Same for all lots				
Bath temperature	900	Degrees F. - Same for all lots				
Dry Pickled	120	119.5	121.5	115.6	116.5	120.5
Galvanized	158.5	157	164	162	166	173
Zinc Deposited	38.5	37.5	42.5	46.5	49.5	53.5

Results

The complete results are shown in the table below.

Recommendations

The withdrawal time is one of the most important operations in galvanizing as it directly affects the weight of zinc deposited as coating. The correct withdrawal time is that speed which will not give any drippings when the last edge of the article is withdrawn. High metal deposit is caused by the piece being drawn so fast that a large amount of the molten metal is dragged out with the article. The proper time is the speed which just allows the article to drain so that when it is entirely out of the bath no spelter runs off and drops back into the bath.

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The withdrawal time varies according to the temperature of the bath, the size of the article, the gage of the base metal, and the speed of operation (production). As seen by the results of this experiment the proper withdrawal time is .25 minutes or 15 seconds which entirely verifies the results obtained in the laboratory tests.

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The principles involved in the withdrawal time as it influences the weight of zinc deposited are complicated by a number of factors. The very simplest application is with the withdrawal and drainage of a plain sheet where the metal is absolutely free to run-off and drain-off naturally. When the base metal is formed into articles of metalware or shapes, tanks, or

various commercial forms, then wire beads in the rims, angles for braces, handles, spouts, etc., all tend to distort the results of free drainage of the zinc from the article.

★ ★ ★

A comparison of the results as shown on the graph from the laboratory tests and the results shown by the graph from actual plant galvanizing of 6 lots of 100 each regular grade water pails, shows that the results are identical, and that the most economical withdrawal time in each test was from 15 seconds to 1 minute withdrawal time. In terms of actual distance this is approximately a speed of 3 feet per minute as the maximum speed, and 8½ inches per minute as the slowest minimum speed.

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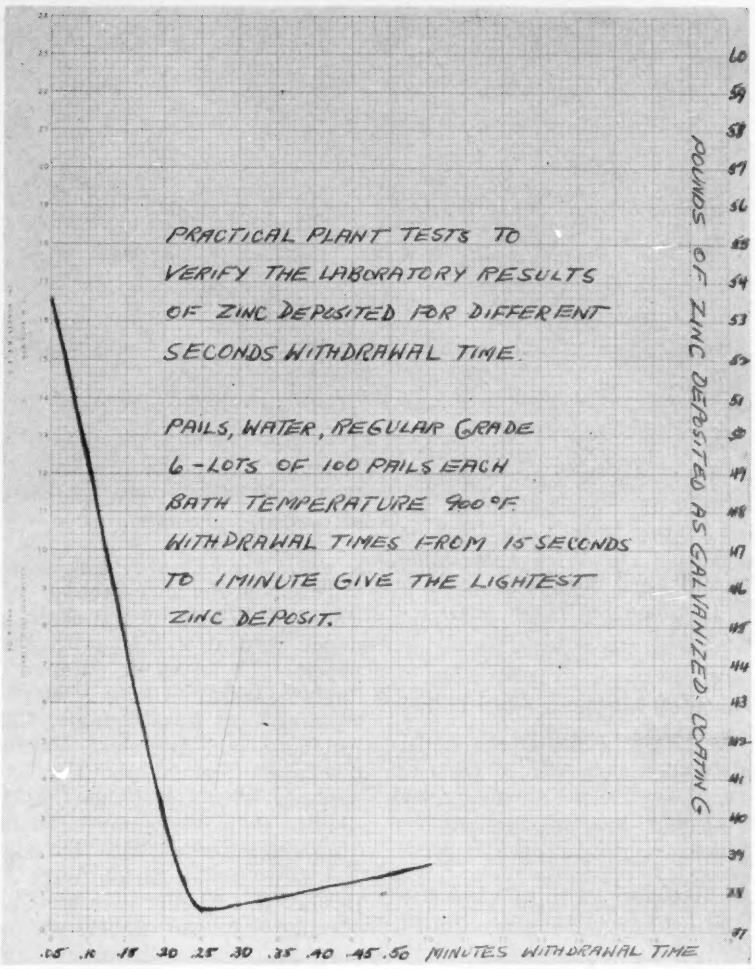
The increase in weight of zinc deposited at the two ends of the graph is caused by two different actions, the one mechanical, the other chemical. When the withdrawal becomes too fast, the molten zinc is dragged out of the bath on the sheet or article before it has time to drain off back into the pot; when the withdrawal time becomes too slow, then the molten zinc of the bath begins to alloy with the iron of the base metal, and continues to build up more and more, the longer the article stays in the molten zinc.

★ ★ ★

In such fields of galvanizing as pipe and electrical conduit the molten zinc is drained down the pipes and then blown out with super-heated steam. The same can be said in sheet galvanizing where the excess zinc is squeezed off with high pressure rolls, and in wire galvanizing where the excess metal is wiped off with asbestos wipes. It can readily be seen that in these fields of hot dip galvanizing that the withdrawal principle cannot function.

★ ★ ★

Here again, we have illustrated where the basic principles of galvanizing overlap. It is a definite scientific principle of galvanizing that, "the longer the submersion


PRACTICAL PLANT TESTS TO VERIFY THE LABORATORY RESULTS OF ZINC DEPOSITED FOR DIFFERENT SECONDS WITHDRAWAL TIME.
PAILS, WATER, REGULAR GRADE
6 - LOTS OF 100 PAILS EACH
BATH TEMPERATURE 900°F.
WITHDRAWAL TIMES FROM 15 SECONDS TO 1 MINUTE GIVE THE LIGHTEST ZINC DEPOSIT.
POUNDS OF ZINC DEPOSITED AS GALVANIZED COATING
MINUTES WITHDRAWAL TIME

time in the molten zinc, the heavier the zinc will be deposited as galvanized coating." Now the same thing happens with the principle of withdrawal, namely, "The slower the withdrawal time (which means also, a longer submersion time) the heavier the zinc will be deposited as galvanized coating." In this example however, both of these basic galvanizing principles are always operating in the same direction, namely, to increase the zinc deposited as galvanized coating. On the other hand, the other part of the graph which shows a very rapid increase in zinc deposit as the submersion time in the metal is shortened, also tends to increase the weight of metal as coating, simply by the mechanical action of dragging the zinc out of the bath by too fast a withdrawal time.

★ ★ ★

In the early days of pipe galvanizing, whole bundles of pipe were held in a chain sling and put into the galvanizing pot on a steel rack. The pipes were then taken out with a hook one at a time. It can readily be seen that the first pipes out had a short submersion time, perhaps within the 15 seconds to 1 minute time of the withdrawal graph. The other pipes each one remained in the bath a little longer, until the last pipes out would probably have a zinc deposit as coating, far out on the withdrawal graph beyond one minute. The coating on these pipes would be very heavy, and very brittle. Modern practice has remedied this condition.

★ ★ ★

A study of the withdrawal principle shows that here is a very important way to save zinc, and that means reduce galvanizing

(*Please turn to page* 726)

The New York Regional Meeting of The Wire Association

New York Regional Meeting has record attendance and excellent program of papers. General Cable Company goes all-out to make Plant Inspection Trip successful. Directors select Medal Award winner for 1954 and name operating committees.

Our program committees seem to be in the business of breaking records. The 1955 meeting set a new high for regional meetings with a total registration of 456 men at the New York Regional Meeting of **The Wire Association,** held on April 28th and 29th at the Commodore Hotel in New York City.

Thursday Morning, April 28th

The Registration Desk, scheduled to open at 9 A.M., started its work of registering members and guests shortly after 8 o'clock.

* * *

At 10 o'clock, with approximately 180 men in attendance, the Insulated Wire Section opened with **David M. Schmid** serving as chairman of the meeting. Papers were presented as follows: "Hycar 2202, General Properties and Electrical Characteristics" by **Howard G. Womack,** Development Engineer, **B. F. Goodrich Chemical Co.,** Cleveland, Ohio, and **Gerard W. Kukro,** Advance Development Engineer, **General Electric Company,** Bridgeport, Conn.; "Kel-F—Insulation on Wires for High Temperature Applications" by **Jules Jupa,** Sales Engineer, **M. W. Kellogg Company,** Jersey City, N. J.; "Wire Insulated with 'Teflon' Tetrafluoroethylene Resin for High Temperature Uses" by **Dr. J. J. Ondrejcin,** Development and Service Section, **E. I. Du Pont de Nemours & Company,** Wilmington, Del.; and "Inorganic Fibruous Insulations for Wire" by **E. Q. Harrigan,** Secretary, **Continental Wire Company,** Wallingford, Conn. Due to illness, Mr. Harrigan's paper was read by **Frank J. Clark,** Plant Manager of the same company.

Thursday Afternoon, April 28th

Simultaneous sessions under the auspices of the Ferrous and Non-Ferrous Sections were held in the afternoon.

* * *

The Non-Ferrous Section, with **David M. Schmid** in the chair, got under way at 2 P.M. with three papers. These were: "Repair of Cable Jackets Using Hot Gas Welding" by **Ross Pringle,** Chief Engineer, and **Andrew J. Varenelli,** Chief Chemist, both of the **Ansonia Wire and Cable Co.,** Ansonia, Conn.; "Some Bending Characteristics of 75% Cartridge and 65% Yellow Brass Wire" by **Lewis E. Thelin,** Asst. Chief Metallurgist, and **Robert O. Abbott, Jr.,** Asst. General Foreman, **Bristol Brass Co.,** Bristol, Conn.; and "World Supply and Price of Copper" by **Bernard Aronson,** President, **Spencer Wire Corporation,** Union, N. J. Messrs. Pringle and Varenelli's presentation was followed by a sound motion picture in color, illustrating actual repair work in the field as described in the paper.

* * *

At the same time the Ferrous Section, with **William D. Bawden** as Meeting Chairman, heard three papers: "Titanium—The Metal and the Industry" by **Ward M. Minkler,** Asst. Manager of Market Development, **Titanium Metals Corporation of America,** New York City; "The Influence of Nail Design and Manufacturing Practices on Joint Strength" by **Allan B. Dove,** Manager, Research Department, **Steel Company of Canada, Ltd.,** Hamilton, Can., and "Fabrication of Resistance Alloys' by **William L. Stryker,** Chief Process Engineer, **Wilbur B. Driver Co.,** Newark, N. J.

* * *

All papers, morning and afternoon, had large audiences and were followed by lively discussions, indicating both the interest in and the importance of these presentations.

Thursday Evening

At 6 o'clock the doors were opened for the cocktail party at one end of the grand ball room, where **Randolph V. Miller** and his associates in the **R. H. Miller Company** were hosts to approximately three hundred persons. This very pleasant interlude was well handled and a delightful prelude to the banquet that followed at 7 P. M. in the main portion of the room. The many ladies who accompanied their husbands to the New York meeting attended both the cocktail party and the banquet. Ladies were provided with corsages through the thoughtfulness of **Mrs. R. S. Spengel,** Assistant Secretary of the Association.

* * *

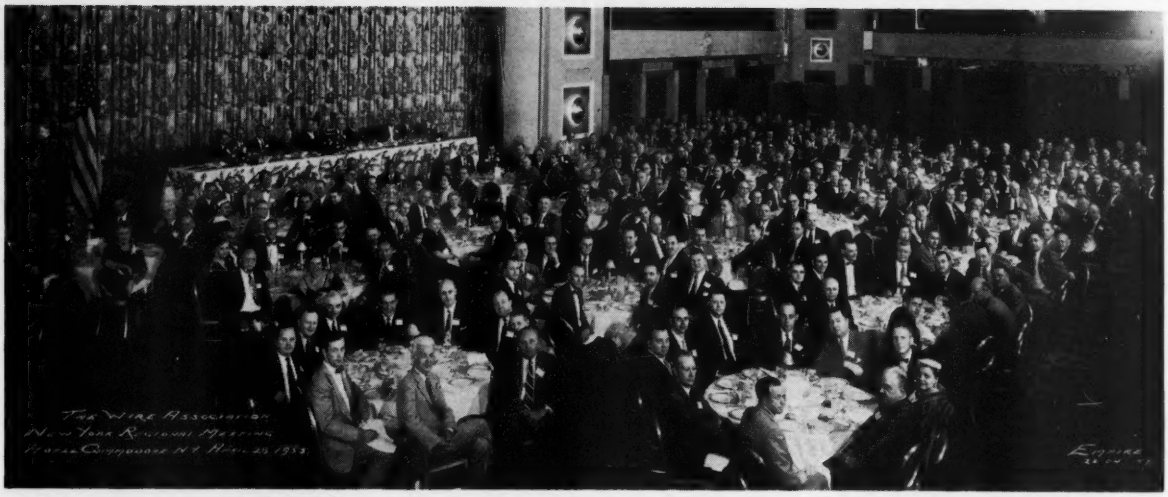
At the speakers' table were seated, besides the Program Committee members, **Richard E. Brown, Ralph B. Roth, Clem L. McGowan** and **President Leslie C. Whitney.**

* * *

The dinner and service couldn't have been better. Many comments later in the evening confirmed the opinion that it was one of the best we have had at an Association function.

* * *

After dinner, except for a few words of greeting from several of



Photograph of Association members and guests at the New York meeting banquet.

the officers and a cordial welcome by Mr. Whitney, the gathering dispersed sufficiently early to allow those who had arranged to take in shows to be on their way in good season.

Friday Morning, April 29th

At 8:30 A.M. a well-attended Symposium on Aluminum Wire got under way. **William D. Bawden** again occupied the chair and presided over the meeting. Five papers devoted to various phases of aluminum wire manufacture comprised the session, which was followed by a spirited question and answer period. These papers were: "Aluminum Wire Drawing" by **Roger J. Schoerner,** Vice President, **Southwire Corporation,** Carrollton, Ga.; "Dies for Drawing Aluminum Wire" by **Edgar T. Miller,** Manager, Wire Die Sales, **Firth Sterling, Inc.,** Pittsburgh, Pa.; "Aluminum Wire Drawing Lubricants" by **William B. Bauzenberger,** Sales Manager, **Apex Alkali Products Co.,** Philadelphia, Pa.; "Dry Lubricants for Large Diameter Aluminum Wire" by **Chester F. Wickwire,** Treasurer, **Wickwire Bros. Inc.,** Cortland, N. Y.; and "Filtering Lubricants for Aluminum Wire Drawing" by **H. T. Jones,** Vice President, **Hercules Filter Corp.,** Hawthorne, N. J.

★ ★ ★

This interesting session adjourned a little before 11 A.M. to allow the people to get the busses due to start for Perth Amboy at that time.

Friday Afternoon, April 29th

Seven busses carrying over 300 people left for the Perth Amboy plant of the **General Cable Corporation** arriving there about noon, where they were served a bountiful and tasty luncheon in the company cafeteria through the courtesy of General Cable's management. As their guests completed their meals, they were formed into groups of ten, assigned to a guide and conducted through as much of the plant as time permitted.

★ ★ ★

At this plant the company manufactures rods, wire, mineral insulated cable and rubber and plastic insulated wires and cables.

★ ★ ★

The first point shown was the new semi-automatic continuous rod mill, installed in 1951, that had been designed jointly by General Cable and Farrel-Birmingham. It was a beauty.

★ ★ ★

From there guests were conducted through the wire mill, where heavy, intermediate and fine Vaughn wire drawing machines were seen in operation.

★ ★ ★

The next department visited was the one in which is produced their "Pyrotenax" safety insulated cable, a British development that is made in this country only at this plant. Samples of this unusual copper-jacketed cable were given to each visitor.

★ ★ ★

The final division through which the group were guided was the huge new building where rubber and plastic wire and cable is produced. Here all operations, including rubber processing, extrusion, stranding, lead covering, and various types of insulating were observed, down to a variety of final packaging operations for shipment.

★ ★ ★

This plant was a joy to visit. Housekeeping was excellent, every operation was uncrowded and smooth-flowing and equipment was on the whole more up-to-date than is found ordinarily in cable plants.

★ ★ ★

The plant's operations are conducted under the watchful eye of **E. J. Koth,** Plant Manager. The officers and directors of The Wire Association are grateful to Mr. Koth and to General Cable's management for providing this most worthwhile opportunity to see the plant and for the many courtesies extended to the guests. The tour concluded the two-day Regional Meeting activities.

★ ★ ★

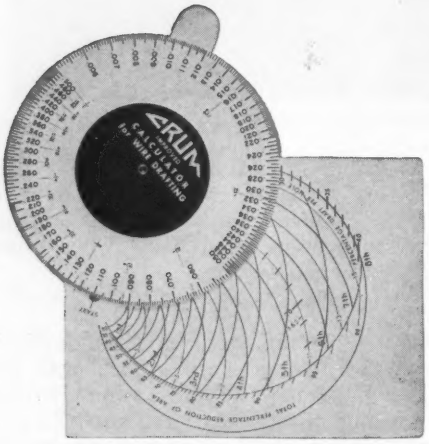
Something new was tried this

(*Please turn to page* 708)

THE NEW and IMPROVED . . .

CRUM CALCULATOR

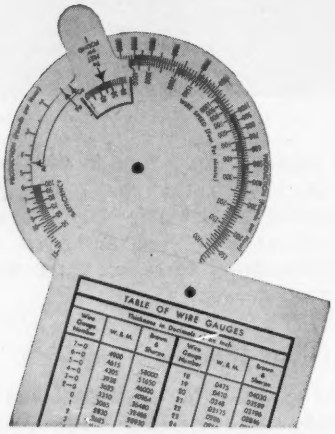
FOR WIRE DRAFTING



Front view of Crum Calculator.

THIS NEW DOUBLE-PURPOSE CALCULATOR WILL:

1. Provide quicker and more accurate information on die sizes and reduction areas;
2. Calculate wire production rates for various speeds and efficiencies.



Reverse view of Crum Calculator.

SOME OTHER FEATURES OF THE CALCULATOR

- Has new scale for more accurate determination of small percentages.
- Gives readings in B & S gauges.
- Intermediate lines provide reductions for 16 holes in one setting.
- New rectangular shaped back for better protection of calculator.
- More legible % draft-per-hole scale.
- Vinyl plastic construction, resistant to wear, warping, dirt, perspiration, wire drawing soaps—can be cleaned.
- Still fits your vest pocket.
- Handy tables of W & M and B & S gauges.
- Feet per pound calculating scale for steel, copper and aluminum wires.
- Durable, accurate, easy to use.

The improved Crum Calculator is worth its weight in gold in time saving —no laborious mathematical calculations necessary when you use it. Instruction sheet with examples accompany each Calculator. You should have one or more in your wire drawing department.

THE PRICE: $5.00 EACH

Send your orders to:

WIRE AND WIRE PRODUCTS

453 MAIN STREET **STAMFORD, CONN.**

(Exclusive distributors)

New Wire and Cable Developments Revealed by NEMA Manufacturers

New developments in the wire and cable industry were discussed at the April 26-27 meeting of the National Electrical Manufacturers Association's Wire and Cable Section before seventy-five of the industry's executives at the Biltmore and Roosevelt Hotels in New York.

New developments in magnet wire testing equipment, new methods of packaging magnet wire, a new type of thermoplastic building-wire that is getting wide consideration in the industry, and the anticipated improvements in the critically tight copper supply situation were among the subjects discussed at the NEMA meeting.

New Designs in Test Equipment Demonstrated

New designs of magnet wire test equipment were demonstrated by representatives from Indiana Technical College, Fort Wayne, Indiana. These included a scrape abrasion tester, a copper softness tester, mercury bath insulation, and a dielectric breakdown tester. This organization is doing research and development work for industry and is producing a line of test equipment for use by manufacturers and users of magnet wire.

New Methods of Packaging Magnet Wire

Magnet wire manufacturers showed intense interest in the discussion of **A. C. Sheldon** of **Rea Magnet Wire Company, Inc.,** concerning new and more efficient methods of packaging magnet wire that promise to come into wide use in the industry. In place of the conventional wire spools, a variety of steel pails and drums and fiber containers are being utilized. The advantages that stem from this type of packaging are that the containers need not be returned, that they offer excellent mechanical and weatherproof protection for the wire, and are more desirable for shipping purposes.

New Type Thermoplastic Building Wire

A new type of thermoplastic building wire, developed by **The Plastic Wire and Cable Corp.,** is receiving wide consideration in the industry. **H. H. Weber,** representing NEMA on Panel No. 6, **National Fire Protection Association,** reported the latest developments on this THW moisture and heat-resistant building wire, which is now being considered for recognition in the National Electrical Code. If accepted, this wire would be suitable for use in wet locations designed for operating temperatures as high as 75C. Mr. Weber is sales manager, Electrical Wire and Cable Department, **United States Rubber Company.**

Domestic Copper Supply and Demand to Be Balanced

"Even though the domestic price of copper is 36 cents a pound, only one cent a pound below an all time record high, the supply is still inadequate to meet consumers' needs," according to **Dr. Joseph Zimmerman,** editor-in-chief of the "Daily Metal Reporter."

★ ★ ★

He attributed the present tight supply situation to various developments, among which were: strikes in the copper mining industry in 1954 that resulted in a loss in output of about 60,000 tons; the purchase by the United States Government of 100,000 tons of copper that Chile held and that might have come on the market; the strikes at the copper mines in northern Rhodesia during January and February of this year, and the fact that there has been a marked industrial and economic improvement in Europe that had not been anticipated. "The European pipelines were virtually empty of copper and had to be refilled," he said, "and domestic consumers who had also depleted their inventory last year fearing a break in price, became panicky buyers when the Far Eastern situation took a serious turn." Because the world price of copper has been higher than the domestic quotation, foreign copper which is needed here has by-passed the United States market. "The high price for copper, however," said Dr. Zimmerman, "has stimulated production in the United States and throughout the world." He expressed the opinion that before 1955 is over, domestic supply and demand will be in balance.

Joint Standards for the Industry

S. J. Rosch of **Anaconda Wire & Cable Company,** and president of the **Insulated Power Cable Engineers Association,** outlined a new procedure by which NEMA and IPCEA will issue joint standards for the electric wire and cable industry, replacing some of the individual standards issued by each organization.

Effects of Inadequate Wiring

A dramatic new adequate wiring presentation was made by **Norman Wicks,** manager of the **National Adequate Wiring Bureau.** His presentation included the use of a wide screen, cinemascope type slidefilm program, and pointed out the very adverse effects which inadequate wiring has on all segments of the electrical industry. The film suggested how utilities, manufacturers, contractors, distributors, and dealers can all benefit by their joint action in this field. This presentation is being released for national distribution and is available for industry groups through the National Adequate Wiring Bureau.

Public's Attitude Toward Business Men

L. R. Boulware, vice president in charge of Public Relations at the **General Electric Company,** dis-

(*Please turn to page* 727)

Government Wire Production Information

Government Purchases

Quantities bought through March 31, 1955 under the Government's purchase programs for domestic tungsten, manganese, chrome, mica, beryl, asbestos and columbium-tantalum have been announced by **Edmund F. Mansure,** Administrator of General Services.

★ ★ ★

The programs were established to stimulate the search for and the production of strategic and critical materials in the United States. They are separate from the exploration program of the Defense Minerals Exploration Administration, Department of the Interior.

★ ★ ★

Tungsten. Tungsten concentrates under the Government purchase program are accepted at various milling points, mostly in the West.

The regulation setting up the tungsten purchase program was published in the Federal Register on May 11, 1951. Purchase of 3,000,000 short ton units (20 pounds each) of contained tungsten has been authorized. Delivered to date: 1,677,453 short ton units.

★ ★ ★

Manganese. Manganese is accepted at four depots—Butte and Philipsburg, Montana; Deming, New Mexico, and Wenden, Arizona. Manganese is also accepted in carload lots at any rail point in the country. The Wenden, Arizona depot will be closed April 29.

★ ★ ★

Regulations establishing the Butte, Philipsburg and Deming depots were published July 21, 1951; the Wenden regulation was published July 3, 1952, and the carload regulation on July 9, 1952.

The quantities authorized are: 6,000,000 long ton units (22.4 pounds each) of contained manganese for Butte and Philipsburg together; 6,000,000 long ton units for Deming; 6,000,000 long ton units for Wenden, and 19,000,000 long ton units for the carload program.

★ ★ ★

Delivered to date: Butte and Philipsburg, 1,440,006 units; Deming, 2,307,346 units; Wenden, 5,406,209 units; carload program, 2,725,306 units.

★ ★ ★

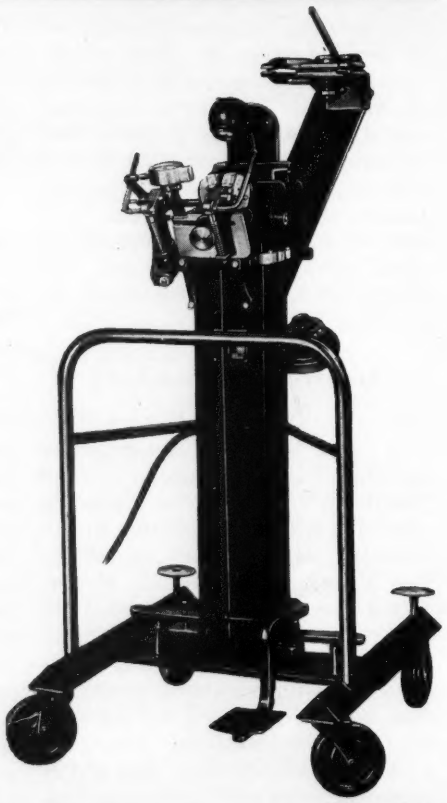
Under authority granted by the Office of Defense Mobilization, purchases of manganese at the depots is now being made on the basis of recoverable, rather than contained units, and reports of receipts are made on that basis.

MICROMETER PRECISION — MICRO-WELD TRADE MARK REGISTERED

MODELS J-3-S and J-4-S AUTOMATIC MICRO-WELD BUTT WELDERS

These welders are used for welding high and low carbon STEEL, and STEEL ALLOY wire, ranging in size from .020" to .160" diameter. All operations on these units, which include the clamping of the wire being welded, contacting the welding switch, and upsetting the weld, are made by a single downward stroke of the foot pedal. Welders for high carbon steel wire are equipped with the exclusive MICRO-WELD Dial indicating annealing device to facilitate the annealing operation of high carbon wire.

Standard equipment with these units include annealing dies, filing vise, light extension cord, and mounting on a 4-wheel truck. Special units can be furnished for crane mounting.



MICRO PRODUCTS CO.

20 NO. WACKER DR., CHICAGO 6, ILL.
Telephone: STATE 2-7468

Chrome. Chrome ores and concentrates are accepted at a depot at Grants Pass, Oregon.

★ ★ ★

The program was published August 28, 1951. Purchase of 200,000 long tons of ores and concentrates has been authorized. Delivered to date: 82,402 long tons.

★ ★ ★

Mica. Mica is accepted at three depots—Spruce Pine, North Carolina; Custer, South Dakota, and Franklin, New Hampshire. It is accepted in three forms—block, film and hand-cobbed. Under a revision of the program announced July 23, 1954 the depots now will accept nonruby mica, subject to electrical tests, as well as ruby mica.

★ ★ ★

The program was published March 15, 1952. Purchase of 25,000 short tons of hand-cobbed mica or the equivalent has been authorized. (For purposes of the program, 90 pounds of block or film mica are considered as the equivalent of one ton of hand-cobbed mica.) Delivered to date: 5,503 tons of all types at all depots.

★ ★ ★

Beryl. Beryl is accepted at three depots: Franklin, New Hampshire; Custer, South Dakota, and Spruce Pine, North Carolina. The program was published October 11, 1952. Authorized purchases: 1,500 short tons. Delivered to date: Total, in terms of program, 626 short tons.

★ ★ ★

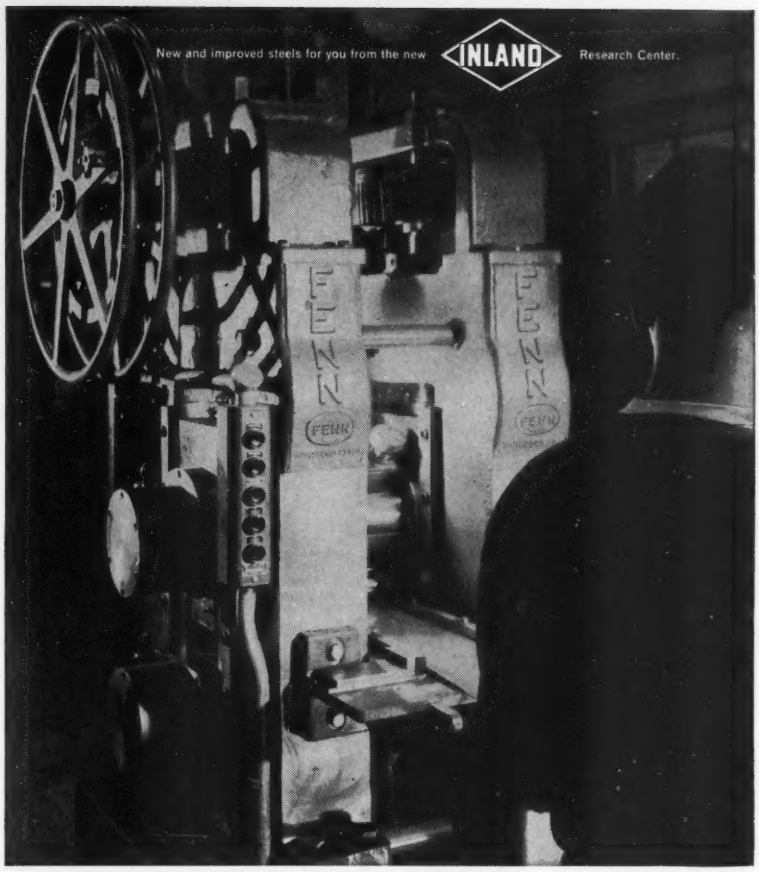
Asbestos. Nonferrous crysotile asbestos in three grades, Crude Nos. 1, 2 and 3, is accepted at a depot at Globe, Arizona. The program was published December 23, 1952.

★ ★ ★

Purchase of 1,500 short tons of Crude No. 1 and/or No. 2 has been authorized. Crude No. 3, which is accepted on a tie-in basis with the other two grades, is not figured into the quantity authorized.

★ ★ ★

Delivered to date: Crude No. 1 and No. 2, 847 short tons; Crude



THIS PINT-SIZE ROLLING MILL MAY SAVE YOU KING-SIZE HEADACHES (AND MONEY TOO!)

At Inland, 'new ideas' are considered as vital a raw material in steelmaking as top grade iron ore and coal. Establishing reserves of this basic ingredient is a continuing job for Inland's research and development people. The new Inland Research Center in Hammond, Indiana, where Inland researchers look for better steels and more efficient ways to make them, is the most recent addition to Inland's 'new idea' resources.

We at Fenn are pleased to quote the foregoing from a recent advertisement of Inland Steel Company of Chicago. We are especially glad that Inland found, in Fenn rolling mills, the precision, flexibility and rugged dependability demanded in their research projects.

Fenn will design rolling mills for all special applications, in a complete range of sizes, and will furnish all accessories. Fenn mills have extra bearing capacity to take higher horsepowers, and are designed for year-after-year accuracy —owning cost is exceptionally low.

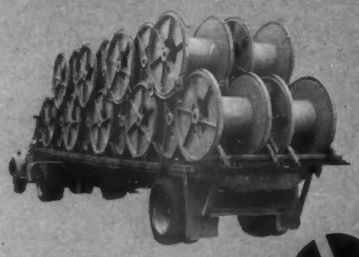
FENN

PRECISION ROLLING MILLS—TURKS HEADS—WIRE SHAPING MILLS—SWAGING MACHINES—ACCESSORIES

The Fenn Manufacturing Company, 410 Fenn Road, Newington, Connecticut

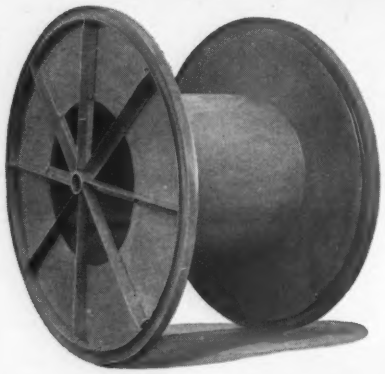
There's no premium on INGENUITY at NYECO

Here are 32 Steel Shipping Reels being delivered on 1 especially rigged truck. One more example of the versatility and flexibility that go into every NYECO job . . . that make for happy customer relationships.



I'm a NYECO customer

NYECO Steel Shipping Reels



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because they cost so little more, last *12 times* longer than wooden reels, require minimum maintenance. Rugged weatherproof, splinter-proof, warp-proof construction protects costly cable against damage due to dropping, bouncing, rough handling. It doesn't pay to risk an investment of thousands on inferior reels.

ANY QUANTITY | ANY SIZE | ANY LOAD | FLANGE DIAMETER FROM 36" UP

SERVICE IS OUR BUSINESS: Qualified engineering staff will translate your problems into practical designs, from idea to finished product—or we'll work from your blueprints. 2 large modern plants with every automatic production facility, 100 in skilled personnel. Fast deliveries—motor, rail, water shipping at the premises.

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TELEPHONE: WHitehall 4-5380 **CABLE:** NYECO, N. Y. **PLANTS:** YONKERS, N. Y.

These leading mills prefer NYECO Steel Reels: OKONITE, ROEBLING, WESTERN ELECTRIC, GENERAL CABLE, ANACONDA, PHELPS DODGE

No. 3, 384 short tons. Total, in terms of program, 847 tons Crude Nos. 1 and 2.

★ ★ ★

Columbium-Tantalum. Columbium-tantalum ores and concentrates are accepted in small lots at three depots—Custer, South Dakota; Franklin, New Hampshire, and Spruce Pine, North Carolina. The regulation covering such purchases was published October 30, 1952. No specific limits have been set for the depots.

★ ★ ★

Columbium in lots of 2,000 pounds and over and tantalum in 1,000 lb. lots and over is purchased from both domestic and foreign sources through four agents—Fansteel Metallurgical Corporation, North Chicago, Ill.; Wah Chang Corporation, New York, N. Y.; Kennametal, Inc., Lathrobe, Pennsylvania, and Emergency Procurement Service, GSA, Washington, D. C. Delivered to date (Foreign and Domestic combined): 9,084,-159 pounds.

★ ★ ★

Purchase of 15,000,000 pounds of contained combined columbium-tantalum pentoxide has been authorized.

CF&I Supplies Navy With Mooring Lines

It will take some of the world's strongest rope to serve as mooring lines for the U. S. S. Forrestal, the Navy's new super aircraft carrier. The 59,650 ton vessel has a flight deck nearly four acres in area, and is as tall as a 25 story building. Wire rope with the necessary flexibility and strength for this tough job was supplied by the **Wickwire Spencer Steel Division** of **The Colorado Fuel and Iron Corporation,** which makes wire for everything from watch springs to bridge cables.

★ ★ ★

The Forrestal, which was christened in December, has been more than two years in the building, and will be completed late in 1955. When fully equipped, the ship will carry a crew of 3500 men and will be one of the nation's most formidable weapons of defense.

Primarily as a means of conserving strategic materials vital to this nation's survival in war, the laboratory undertook a survey of ceramic materials, decided it was on a relatively unexplored road, and then worked out original processes.

★ ★ ★

What was needed was to compound fine aluminum oxide powder into the densest, hardest kind of "chinaware" or ceramic. Aluminum oxide is made from bauxite—aluminum ore—and is one of the hardest, toughest known abrasives used in grinding wheels, and sanding tools.

★ ★ ★

But the ceramic tool is brittle, compared with other cutting agencies. Further research disclosed a method for holding it against the steel to be cut in such a way that the ceramic tip was given maximum support and the steel strip peeled off is removed cleanly with a specially-designed chip breaker.

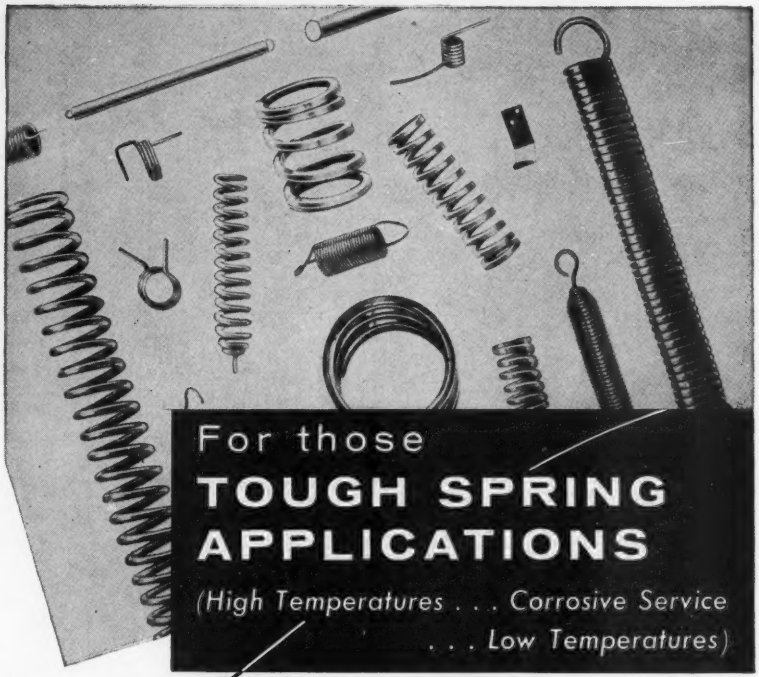
ASTM Symposium on Effect of Cyclic Heating and Stressing On Metals at Elevated Temperatures

It has been long realized that much, if not most, engineering use of metals at elevated temperature involves periodic changes in temperature or stress or both. However, the engineer has available for most metals only constant stress and temperature data for design purposes. This poses the question of how changes in stress or temperature modify the constant stress and temperature behavior of metals and thus the designs based on such behaviors.

★ ★ ★

This Symposium is intended to cover those situations involving relatively slow changes in stress or temperature or both. In practice many such changes are aperiodic, and much of the experimental work covering this Symposium uses periodic variations. It is hoped that certain general considerations may, however, be deduced from the experimental results herein.

★ ★ ★



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ALLOY Wire...Rod...Strip

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Alloy Metal Wire Division engineers will work closely with you to develop any special engineering and fabricating properties you may require. Your inquiries are always welcome.

Send today for our new Nickel Alloy and Stainless Steel Properties Charts.

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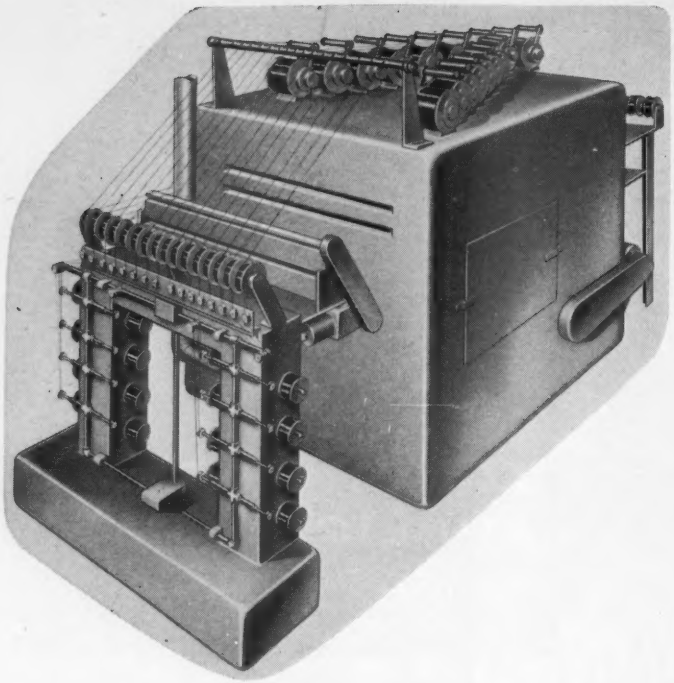
Prospect Park, Pennsylvania



Increased Enameling Speed with Minimum Wire Breakage

By incorporating advanced design techniques with years of wire enameling research, this new MOCO fine wire enameling oven offers advanced enameling speeds with a marked decrease in breakage. The result is a cost-cutting operation with increased production.

The equipment is competitively priced and combines versatility with simplicity. The high degree of skill formerly required in performing this operation has been reduced—control of the product is handled by the machine.

OTHER NEW FEATURES INCLUDE:

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- A wide range of insulating materials may be handled.
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PRODUCERS OF COMPLETE ENAMELING SYSTEMS FOR ALL WIRE SIZES

MICHIGAN OVEN COMPANY
425 BRAINARD ST., DETROIT 1, MICHIGAN

The information in this Symposium should be of use both to the engineer-designer, as an aid in designing for stress or temperature variation, and to the researcher as a spur to greater efforts to obtain more exact data or design criteria.

* * *

Copies of this publication, No. 165, containing 189 pages, can be obtained from the **American Society for Testing Materials,** 1916 Race Street, Philadelphia 3, Pa. at $3.00 each.

New Engineering Building to be Started at Cleveland Crane

Excavation will be started this week on a new $300,000 Engineering Building at **The Cleveland Crane & Engineering Co.,** Wickliffe, Ohio. It will be a 128 x 71 foot brick building with a second floor section at rear measuring 25 x 138 feet. Hallways connecting with the present main office building will be provided.

* * *

The building will accommodate 80 engineers and draftsmen engaged in designing Cleveland overhead traveling cranes, Cleveland Tramrail overhead materials handling equipment, Steelweld bending presses, heavy power presses and metal-cutting shears which the company manufactures. Offices and conference rooms will be provided for the Director of Engineering and the Chief Engineers of the Cleveland Tramrail and Heavy Machinery Divisions.

* * *

This will be the third building in an expansion program started in January, 1955. A large Shipping and Receiving Building is presently under way and is scheduled for completion by May 15th. A building being erected by the company in Los Angeles for warehousing and local special manufacturing is nearing completion.

Bulletin Describes Lee Wilson Installation

A new bulletin pictures and describes a 24 furnace, 60 base installation at the McLouth Steel Corporation's Detroit mill. The

equipment was made and installed by the **Lee Wilson Engineering Company,** 20005 West Lake Road, Cleveland 15, Ohio, as a part of McLouth's large modernization and expansion program to enable them to produce greater quantities of high quality at competitive prices.

★ ★ ★

Copies of this bulletin, No. LW-155 are available upon request. Please write direct to the company.

A List of American Standards

The 1955 edition has just been published. The 48-page publication lists and indexes about 1500 American Standards. There are 210 for construction and civil engineering, 153 mechanical, 272 electrical, 158 safety, 165 textiles and wearing apparel, 251 photography and motion pictures, 74 petroleum products, 69 chemical, 62 metallurgy, 38 gas-burning appliances, 32 drawings, letter symbols and abbreviations, 18 mining, 11 rubber, 10 office equipment and supplies, and a miscellany of others.

★ ★ ★

Free from the American Standards Association, 70 East 45 Street, New York 17.

ABSTRACTS

MOLYBDENUM WIRE
Battelle Mem Inst. Met Ind 1955 Vol 86 (8) p 46 (Feb 25)
Specimens heated to 3,800 deg F (2,093 deg C) in 15 min showed erratic results, some being ductile, others brittle. Samples heated more rapidly than 15 min were ductile unless slowly reheated, those heated less rapidly less ductile. Specimens of either type held at 3,800 deg F for 6 hr exhibited over 25% elongation, and were non-reversibly ductile, evidencing solid-state purification. Investigation of behaviour has produced no solution so far.
R C 11.0

★ ★ ★

REVERSIBLE DIAMOND DIE PROVES SUCCESS IN FIELD
Nat Wire Die Co, 30 Irving Place, NYC. Wire & Wire Prod 1955 Vol 30 (2) pp 222-223 (Feb)
Natdi reversible diamond die has undergone 6 mth practical test under normal operating conditions on various types of wires from stainless steel to soft copper and aluminum. Production of initial size in many cases over 100%. Following explanation given: when front reduction angle shows first signs of wear, drawing channel may be still in good condition. With new die, before any abuse of bearing takes place, die is reversed. Wire therefore drawn on new reduction angle and unabused bearing can continue producing wire for extended time. Eg, if

is
- Hot-Extruded
- Annealed
- Drawn

for highest strength and quality

Titan Brass Wire has precisely uniform gauge . . . color . . . texture . . . temper . . . is free from physical defects. For making highest-quality rivets, bolts, nuts, eyelets, fasteners, screws, studs, binding posts, terminals, washers, pins and nails . . . order Titan Brass Wire. Compositions and tempers are supplied to meet every requirement. Let us help you choose the proper wire composition and temper for **Heading & Extruding**
Heading & Drilling or
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Mill Depots: Bellefonte, Pa., and Indianapolis

Write today for free folder "Titan Brass Wire" listing grain sizes, weights, tolerances and other data. Address: Customer Service Division, Titan Metal Mfg. Co., Bellefonte, Pa.

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General Offices & Plants: Bellefonte, Pa.
Quality Alloys by Brass Specialists

The above Knurled Head Machine Screw represents another difficult cold heading job successfully accomplished at lower cost per unit by Keystone "Special Processed" Cold Heading Wire.

The superior grain flow characteristics of "Special Processed" Wire provide the desired upsetting and die forming qualities necessary to form the thin head section without cracking. The structural soundness and uniformity of "Special Processed" Wire further proved itself by trouble-free machine operation, longer die life and a finished product of the highest quality.

On your next recessed head or other difficult cold heading job, try "Special Processed" Wire. See your Keystone representative or write for more information.

Keystone Steel & Wire Company
Peoria 7, Illinois
Industrial Wire Specialists

10,000 lb expected on initial size, reverse die after 7,000 lb and continue drawing, thereby gaining additional 7,000 lb. If after inspection size and condition of wire still meets specification, die should be reversed again. Regrinding also said to be improved. New dies produced in sizes of 0.0079 in. and upwards.
G C 11.0

★ ★ ★

FINE RESISTANCE WIRE FOR TELECOMMUNICATION AND SIMILAR PURPOSES (BS 117: 1955)
Brit Standards Inst. Instr in Ind 1955 Vol 2 (9) p 54 (Feb)
Superseding war-emergency standard of 1943; applicable to wires of circular cross-section in 0.0005 to 0.012 in. dia range.
Y* C 1.62 : C 11.0

★ ★ ★

DETERMINING STRESSES IN POLYCRYSTALLINE WIRES
U. Dehlinger, H. Scholl. Zeits Metallkde 1953 Vol 44 (4) pp 136-138; Wire Prodn 1955 Vol 4 (4) pp 7-8 (Mar) (Original in German)
2 illustr.
Y* C 11.0

★ ★ ★

DRAWN WIRE, ITS PRODUCTION AND TREATMENT
J. Korecky, Neuerscheinungen wiss Lit 1954 Vol 3 (24) p 1273 (Dec) (Abstr in German; original in Czech)
Book, SNTL, Prague, 197 pp, 1954, Price Kcs 15.60. Short introduction to methods for producing drawn steel wire. Description of wire drawing plants including surface treatment, testing and use of drawn wire. [Book not in library of Ind Diamond Inf Bur].
G* C 11.0

★ ★ ★

WIRE-DRAWING MACHINES FOR STEEL WIRE
H. Richards (Marshall Richards Machine Co. Ltd). Iron & Coal Trades Rev 1954 Vol 169 (4523) pp 1447-1451 (Dec 17)
Lubrication; uniformity; multiple-die drawing machine; modified accumulation machine; back-pull drawing; and economic aspects.
Y* C 11.0

★ ★ ★

THE ABRASION OF DIAMOND DIES
L. Schultink, H. L. Spier, A. J. van der Wagt (NV Philips' Gloeilampenfabrieken), Appl Sci Res A 1954 Vol 5 (1) pp 1-11 (In English)
9 illustr, 5 plates, 9 ref. See Bibl Ind Diamond Appl 1954 Vol 11 p 230 (Aug).
Y C 11.0

★ ★ ★

THE REFLECTING PRINCIPLE AS AN INSPECTION METHOD
Anon. Ind Diamond Rev 1955 Vol 15 (172) p 51 (Mar)
Survey of different basic applications of optical reflecting principle in drawing die profilometers and reflexion goniometers. 6 ref.
G D 11.0 : D 15.2

These abstracts are published through the courtesy and with the permission of the Industrial Diamond Research Bureau, 34, Holborn Viaduct, London, E.C.1, England. Inquiries regarding them should be directed to the Bureau.

Outstanding Personalities of the Wire Industry

Riverside Metal Co. Acquired by H. K. Porter Company, Inc.

The Riverside Metal Co., Riverside, N. J., has been purchased by **H. K. Porter Company, Inc.** it was announced recently by **T. M. Evans,** Porter's President. Riverside manufactures non-ferrous metals in sheet, strip, rod, wire, bar and circle. The 100-year old concern, "specialists in specialties," is particularly well-known for its phosphor bronze, nickel silver, beryllium copper, cupro nickel, and other special non-ferrous alloys in standard and special grades. Riverside's Keystone Watch Case Division owns and operates a factory producing watch cases, instrument parts, and fuses for cartridges.

★ ★ ★

All of the present directors of Riverside have resigned and the new Board will consist of **T. M. Evans, C. R. Dobson** (Porter's Executive Vice President), **F. A. Rehorst** (Porter's Secretary), **J. C. Leslie** (Porter's Treasurer), and **J. M. Shoffner** (Assistant to the President of Porter). Mr. Evans will be President of Riverside Metal, Mr. Dobson, Vice President, Mr. Rehorst Secretary, and Mr. Leslie, Treasurer.

★ ★ ★

W. Harvey Thompson, assistant to the Executive Vice President of H. K. Porter Company, Inc., will be in charge of activities at Riverside. **Leslie C. Carter,** until now Secretary-Treasurer of Riverside, will be its Comptroller while **John Gribbel,** Vice President-Sales, **Henry Freynik,** Vice President-Research, and **Victor Ritchard,** Vice President, will continue in their present posts.

Armco Elects Officers

R. L. Gray has been elected executive vice president of **Armco Steel Corporation, W. W. Sebald,** Armco president has announced recently.

Scovill Makes Executive Changes

Scovill Manufacturing Company, Waterbury, Conn., has announced the appointment of **Arthur P. Hickcox,** vice president, to be general manager of the firm's main plant operations located here. He joined Scovill January 31, 1910, was named general purchasing agent in 1920 and was elected a vice president in 1940 and a director in 1944. He is a graduate of Wesleyan University.

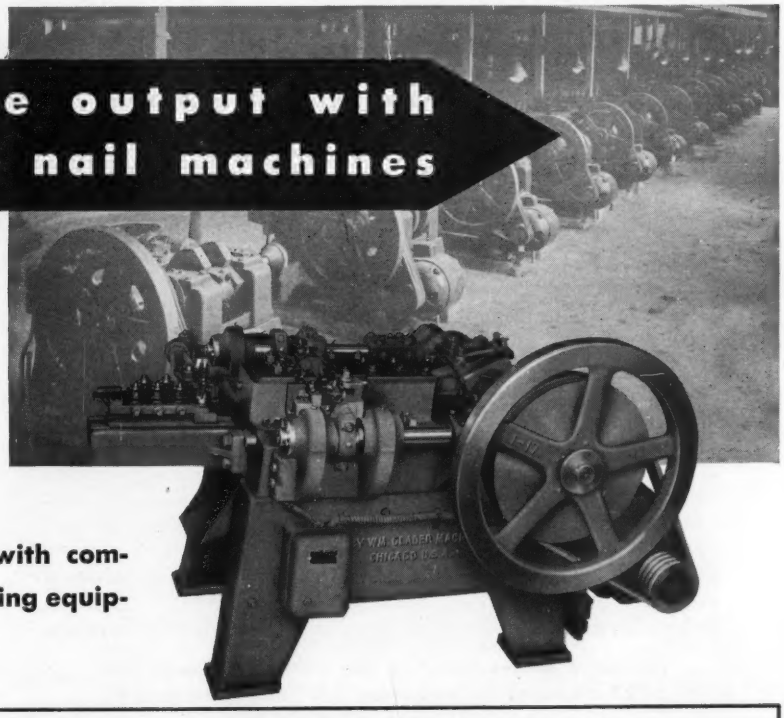
★ ★ ★

Succeeding him as director of purchasing is **Lewis F. Cobb** who has been assistant director.

★ ★ ★

Three appointments were also announced in the comptroller's office, with **Richard B. Harding,** as-

high tonnage output with GLADER wire nail machines



A size and type machine available to make everything from tacks and brads to 12" spikes with maximum efficiency.

Write for 12 page bulletin with complete information on nail making equipment.

WM. GLADER MACHINE WORKS 210 N. RACINE AVENUE CHICAGO 7, ILLINOIS

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

sistant credit manager, named as manager; **Arthur W. Lee** as assistant credit manager, and **Lloyd F. George** as chief general accountant.

★ ★ ★

Other sections take up Contract Research, The Battelle Plan, what Battelle can do for clients, a description of their research facilities, what clients may expect from research and a list of companies served.

★ ★ ★

Copies of the booklet may be obtained by writing the Institute.

To Head Western Division Sales For Pacific Coast Borax

The Pacific Coast Borax Co., Division of Borax Consolidated, Limited, announces the appointment of **W. J. Dibble** as General Sales Manager, Western Division, Bulk Department. In his new position Mr. Dibble will supervise the operation of the Agricultural Sales Division and be responsible for Industrial Sales in the Western States. Mr. Dibble, who was formerly associated with the Oronite Chemical Co., is a graduate of Knox College and the Harvard Business School. During World War II he served in the Navy in aviation ordnance and was discharged as a Lieutenant Commander.

Holds Annual Sales Conference

The Bulk Sales Department of the **Pacific Coast Borax Co.,** Division of Borax Consolidated, Limited, has recently completed its annual sales conference. Approximately sixty men including representatives of the Agricultural Sales Division, Industrial and Plant Food Divisions attended this meeting which lasted a week at Furnace Creek Inn in Death Valley, California. General Chairman of the conference was **J. F. Corkill,** Vice President, Bulk Sales. Guest speakers included **G. J. Buerman,** Director of Purchases, Ferro Corporation of Cleveland, Ohio and **K. D. Lozier,** Vice President, St. Regis Paper Co., New York, N. Y.

Elected to Board of Directors

Three new men were elected to the board of directors of **American Wheelabrator & Equipment Corp.,** Mishawaka, Ind., at the annual stockholders meeting. Among them was **Leslie L. Andrus,** vice-president of the corporation and executive head of its Dust & Fume Control Division. The division headed by Mr. Andrus is known in many industries for work toward prevention of atmospheric pollution. The corporation manufactures Wheelabrator Dustube dust and fume collectors.

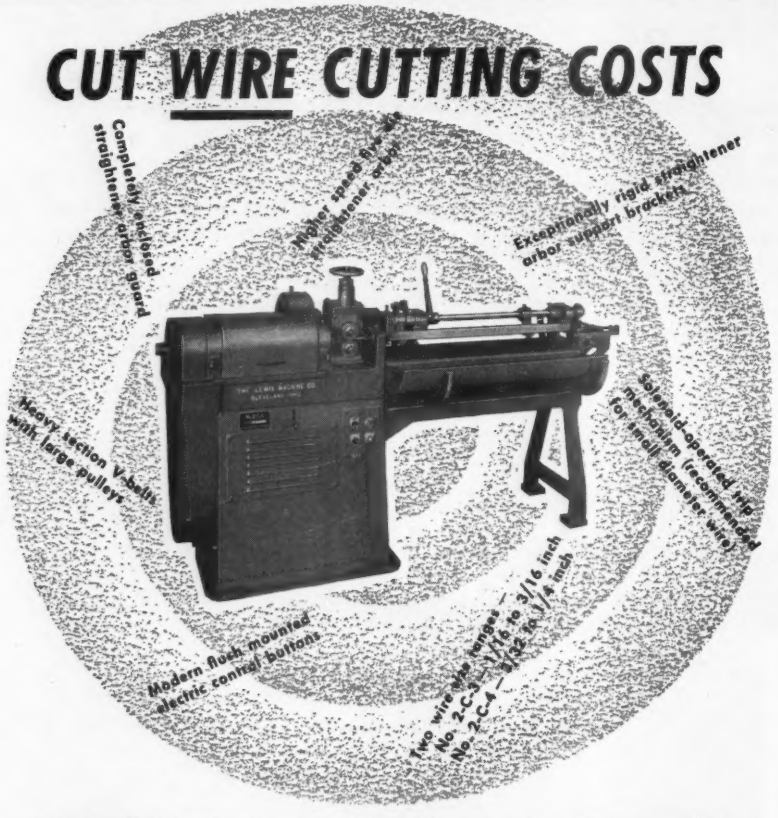
★ ★ ★

Harold M. Miller, vice-president of the corporation since 1944, and a member of the firm since 1923, was also elected a director. The third director elected was **Ray P. Whitman,** first vice-president of Bell Aircraft Corp., Buffalo, N. Y.

★ ★ ★

Verne E. Minich, founder of American Wheelabrator, remains chairman of its 15-man board.

CUT WIRE CUTTING COSTS


Completely enclosed straightener arbor guard
Higher speed five-arbor straightener adapt
Exceptionally rigid straightener arbor support brackets
Solenoid-operated trip mechanism (recommended for small diameter wire)
Two wire size ranges — No. 2-C-3 — 1/16 to 3/16 inch No. 2-C-4 — 3/32 to 1/4 inch
Modern flush mounted electric control buttons
Heavy section V-belts with large pulleys

with LEWIS 2-C wire straightening and cutting machines

Only **LEWIS 2-C-3** and **2-C-4** wire straightening and cutting machines have **all** of these features for fast, accurate and economical production. Their practical design and sturdy construction, reflecting more than 40 years' experience in manufacturing wire machines for **every** production requirement, assure uninterrupted service and maximum production at minimum cost. Write, wire or call today for additional information on LEWIS 2-C wire straightening and cutting machines.

Literature is available on the COMPLETE Lewis line of 23 machines for wire from .012" and stock to 3/4".

THE LEWIS MACHINE CO.

3450 EAST 76th STREET • CLEVELAND 27, OHIO

Heads Heil Process Equipment's Chicago Office

Heil Process Equipment Corporation, Cleveland has announced the appointment of **Robert Scheel** to head their Chicago office located at 400 West Madison Avenue.

* * *

A sales engineer, he is a graduate of Ohio University and formerly was associated with Bendix-Westinghouse before joining Heil as an estimator, and later as sales engineer, where he acquired extensive sales and field engineering experience. At his new post he will represent Heil's complete line of chemical and corrosion-proof equipment which services the needs of the steel, plating and chemical industries with such products as tank and tank linings, lead anodes, fume scrubbers, steam jet agitators, heat exchangers, solid plastic hood and duct systems, and acid-proof maintenance materials.

AS&W Promotions

Advancements in **American Steel & Wire's** electrical sales division moved **Vernon W. Heimberger** to the post of manager of electrical product sales and **George C. Brandle** to director of central area electrical sales, it was announced by **John Graham,** general sales manager for that United States Steel Division.

* * *

Mr. Heimberger, born in 1903, is a native of Cleveland, Ohio. He joined the Wire Division as a sales clerk in 1922. He left the Division in 1927, returned in 1928 and was appointed a salesman in 1931. In 1948 he was made manager of central district electrical products sales. He has served as director of central area sales of the electrical sales division since his appointment in 1951.

* * *

Succeeding Mr. Heimberger is George C. Brandle who moves up from electric products salesman. Born in Chicago, Ill., in 1911, Mr. Brandle was graduated from high school there and attended Northwestern University. Courses in various phases of sales training completed his formal education.

Beginning as a messenger in Chicago Office in 1928, he soon advanced to price clerk in 1929. Made correspondent in 1934, he transferred with that title to the Cleveland Office in 1938.

Opens Kansas City Office

It has been announced by **Pacific Coast Borax Co.,** Division of Borax Consolidated, Limited, that they have opened a new District Sales Office in Kansas City, Missouri, the address being 4010 Washington Street. This office will be a District Sales Office for three divisions of the Company, namely, Package, Agricultural Sales, and Industrial Sales. **Howard B. Cain** is the Package Department Sales Manager for Kansas City District. **Jack Loesel** is taking charge of the Industrial Sales in the area. Mr. Loesel, a graduate Chemical Engineer from Lafayette University, was formerly with the Plastics Division of Union Carbide.

Celanese Engineer Placed In New Post

L. P. Wenzell has been transferred from the Development Department of **Celanese Corporation of America** to the new position of Manager of Special Industrial De-

It will pay you
to get samples of
PLYMKRAFT
IMPROVED CABLE FILLER
To keep up to date on cable filler developments, it takes only an inquiry for samples of PlymKraft. This improved type of twisted paper is available in the exact put up that works best on your equipment, with any type of treatment applied—wax, jute saturant, anthracene.
It is made to fine tolerance, always uniform, and backed by the Plymouth Cordage Company, known as the makers of top quality products since 1824.

Write to:

PLYMOUTH CORDAGE COMPANY

Plymouth, Massachusetts

velopments in the Market Development Department of the Textile Division of the Company.

★ ★ ★

Before joining Celanese in 1953, Mr. Wenzell had been with the U. S. Bureau of Mines, Kolker Chemical Works and Monsanto Chemical Company.

Michigan Oven Division Appoints Engineering Supervisor

Graham Barton has been appointed Supervisor of Engineering of **Walsh Metal Products,** a division of the **Michigan Oven Company,** announces **A. C. Towne, Jr.,** President.

★ ★ ★

All engineering for the division designers and builders of steel fabrications, will be assumed by Mr. Barton, who has worked in drafting, purchasing, field supervision and engineering for Michigan Oven. He is a graduate of the Detroit Institute of Technology.

L.O.F. Sales Meeting

A tour of three midwestern plant facilities is a highlight of the first general sales meeting of the new **L.O.F. Glass Fibers Company,** held March 9-12. Fifty administrative and sales personnel participated.

★ ★ ★

It was the first official meeting of sales personnel of the two firms, Glass Fibers Inc. and the interim L.O.F. Glass Fibers, which merged March 1st.

★ ★ ★

Plants visited were those of the company at Parkersburg, West Va., Waterville and Defiance, both in Ohio, to observe the specific products manufactured at each place.

★ ★ ★

Three sales executives of L.O.F. Glass Fibers presided at the meetings — **J. M. Johns,** Vice President, Director of Sales; **R. W. Capaul,** Vice President and Sales Manager of General Products; and **C. F. Hegg,** Vice President and Sales Manager of Textile Products.

New Annealing Furnace Boosts Stainless Wire Production

Fifty percent greater production capacity has been obtained through addition of a new continuous annealing furnace at the New Brunswick, N. J., plant of **The Carpenter Steel Company's Webb Wire Division.**

★ ★ ★

Installation of the furnace doubles the Webb mill's capacity for annealing stainless steel wire, and gives the company closer quality control on all stainless wire products. It also makes possible savings in operating costs.

★ ★ ★

The furnace operates at temperatures up to 2100°F, and features a nitrogen-hydrogen controlled atmosphere for the brightest possible finish. Webb reports that the new facility permits uniform annealing to a predetermined tensile strength.

★ ★ ★

Wire is drawn automatically through atmosphere-filled tubes by a custom made take-up frame. This frame, which works at varying speeds, keeps constant tension on

Standardize on ACROPAK* Spools!

Only ½ the Weight!

YET STRONG, TOUGH, RIGID . . *LONGER LIFE*

ACROPAK Spools will help you cut wire packaging costs because they give longer service, require less maintenance and cost less to ship. They're strong. They'll take repeated shippings and still run true on the arbor. They're machined to close tolerances. You can run them at high production speeds with fewer snags, less toe-out and minimum end breakage.

THEY CUT YOUR SPOOLING COSTS

Best proof of ACROPAK superior performance are the millions of these spools now used by the biggest names in the wire industry. We've proved it to them—let us prove it to YOU.

- Light Weight
- Precision built
- Reduced cost
- Longer life
- Extra strength
- Dynamic balance
- Greater production
- Low cost reconditioning
- Less maintenance
- Attractive packaging

★ We also make a complete line of heavy-duty shop processing STEEL SPOOLS built to the same high standards of accuracy and rigidity as the famous Acropak aluminum spools.

ACROMETAL PRODUCTS INC.
Division U S Bobbin and Shuttle Co., 616 Fifth Street N., Minneapolis 1, Minn.

the wire as it passes through the furnace.

★ ★ ★

The new furnace handles wire ranging in size from .032" to .162" in diameter. It is housed in a specially built extension to the plant.

New Bulletin Describes Special Uses for Wire Rope

A new cable type overhead conveyor system, an automatic safety device for scaffold workers, a remarkable test of tires, logging operations, handling steel bar stock, boat slings, and well drilling are all shown in new Ropeology Bulletin number 554.

★ ★ ★

Copies may be obtained by writing to **Macwhyte Company,** Advertising Department, Kenosha, Wisconsin.

New Carboloy Distributor

B-H Tool & Supply Co., 5535 Woodward Ave., Detroit, was recently appointed an authorized Carboloy carbide tool distributor by **Carboloy Department of General Electric Company** of the same city.

★ ★ ★

The organization will carry the Department's line of standard and special carbide metal cutting tools, as well as its diamond grinding wheel dressers.

Thompson Wire Expanding

Thompson Wire Company is building a 12,000-sq.-ft. addition to its Baltimore plant. This plant has 50,000 sq. ft. and was placed in operation last spring. General offices of the company are in Boston.

A Correction

An editorial error in the program of the West Coast Regional Meeting printed on page 536 of the May issue of Wire and Wire Products stated that luncheon would be served through the courtesy of "E. H. Edwards, President." This should have read "Sterling Edwards, President" Our regrets and apologies to Mr. Edwards.

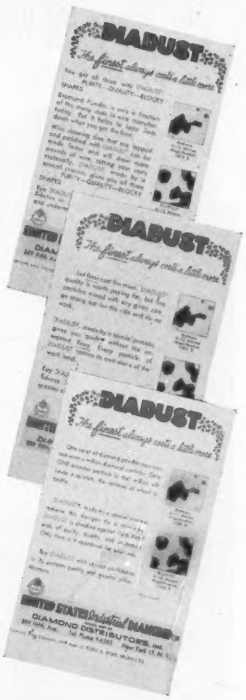
Sales Personnel Shifts By Surface Combustion

William J. Murray has been transferred from the Syracuse, New York Office to take charge of the Ardmore, Pa. Office and **William M. Dempster** has been moved from the Chicago Office to manager the Syracuse Office, according to an announcement by **Henry M. Heyn,** Sales Manager of the Heat Treat Division of **Surface Combustion Corporation.**

A graduate of the University of Utah, Mr. Murray has been with 'Surface' since 1937. He has managed the Syracuse Heat Treat Office since 1941. He replaces **F. C. Starr** who retired on March 31, after 35 years with the company. Mr. Dempster has been with Surface since he was graduated from Purdue in 1941. He has been a member of Surface Combustion's Chicago Heat Treat sales office since 1946.

DIADUST

The finest always costs a little more



Some time ago we set out to prove that, in Diamond Powder, *quality* speaks for itself.

Ours is a simple story. The best in Diamond Powder means three things:

1. **PURITY—freedom from contamination.**
2. **QUALITY—uniform grading that never varies from one shipment to another.**
3. **SHAPE—blocky shapes with hard-cutting, long-lasting points.**

The best in Diamond Powder means DIADUST*.

We will continue to maintain these high standards always.

*Registered

MEMBER

UNITED STATES *Industrial* DIAMOND CORP.

SALES MGT. BY

DIAMOND DISTRIBUTORS, INC.

589 Fifth Ave. Tel. PLaza 9-8383 New York 17, N. Y.

ACCO Appoints General Sales Manager

Appointment of **Vincent E. Lysaght** as General Sales Manager of the **American Chain & Cable Company Inc.**, was announced recently by **Henry Ervin**, Vice President.

★ ★ ★

An MIT graduate, Mr. Lysaght has for many years been recognized as an authority on hardness testing of metals. His book, "Indentation Hardness Testing," which was published in 1949, has wide acceptance in this specialty field.

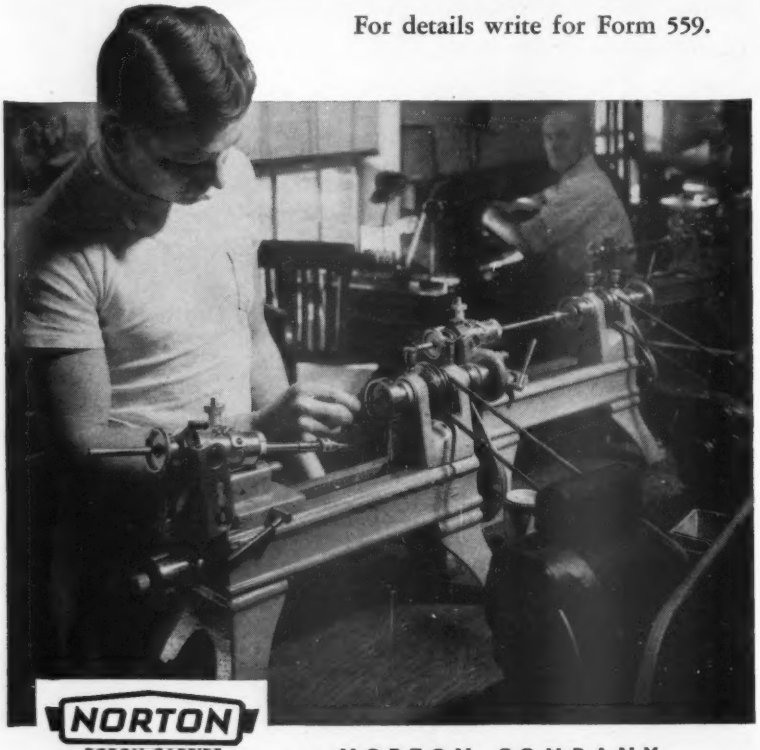
★ ★ ★

He was formerly divisional manager of the Helicoid, Campbell Machine and Wilson divisions of American Chain & Cable. His headquarters will now be at 230 Park Avenue, New York City.

Save Money with NORBIDE® Abrasive . . .

Are you still using costly diamond dust for refinishing your wire drawing dies? Many wire mills are saving money by using NORBIDE Abrasive for ripping or fast stock removal as well as for accurate semi-finishing operations.

For details write for Form 559.



NORTON BORON CARBIDE

NORTON COMPANY
45 New Bond Street • Worcester 6, Massachusetts

NORBIDE® . . . *the hardest man-made abrasive*

Venezuelan Wire Man Visits The States

V. E. Sasson Bigio, President of **Vicson S. A.,** Barquismeto, Venezuela, manufacturer of wire nails and fencing, recently paid a visit to this country for the purpose of acquiring wire drawing and galvanizing equipment the better to control the quality of the wire going into his products. He also had in mind the broadening of his line of wire products.

★ ★ ★

Mr. Sasson called on a number of wire mills to study their methods, talked with several equipment manufacturers and paid a visit to the office of The Wire Association. Senora Sasson accompanied her husband on his extensive trip.

Electric Furnace Adds Design Engineer

Irving A. Painchaud, formerly with **Salem-Brosius,** has been appointed Design Engineer for **The Electric Furnace Company,** Salem, Ohio, designers and builders of

Irving A. Painchaud

fuel fired and electric industrial furnaces.

★ ★ ★

Mr. Painchaud, a member of the Association of Iron and Steel Engineers and a Registered Professional Engineer is now located at the Head Office of The Electric Furnace Company at Salem, Ohio.

Elected Director of Torrington Manufacturing

John DeKoven Alsop was elected a director of the **Torrington Manufacturing Company,** Torrington,

Connecticut at the recent annual meeting of stockholders. Announcement of the new directorship was made by Torrington President **Andrew Gagarin.** The company is a leading producer of fan blades and blower wheels and also manufactures springmaking machinery and auxiliary mill equipment.

★ ★ ★

Mr. Alsop is President, Treasurer and Director of the Hartford County Mutual Fire Insurance Company, Hartford, Connecticut. He is also Treasurer and Director of the Connecticut Valley Mutual Hail Insurance Company.

Made Plant Superintendent By Plume and Atwood

Thomas I. S. Boak, president of the **Plume & Atwood Manufacturing Company,** Thomaston, Conn., has announced the appointment of **John C. Bradford** to the position of superintendent of manufacturing in the Fabricating division of the company. In this position Mr. Bradford will be responsible for supervising and coordinating all production and scheduling operations in this division.

★ ★ ★

Mr. Bradford joined the Plume & Atwood organization in August of 1953 as assistant to the superintendent of manufacturing. He has worked on special projects including many connected with the removal of the Fabricating division from Waterbury to Thomaston.

★ ★ ★

Prior to his association with Plume & Atwood, Mr. Bradford was general manager of a Chicago manufacturing company. He had previously served in supervisory capacities for various Connecticut companies including the **Whitney Blake Company** in New Haven.

Louis Chambre

We regret to announce the untimely death of **Mr. Louis Chambre,** head of the **Balloffet-Vianney Wire Die Co., Inc.,** 6825 Adams St., Guttenberg, N. J.

★ ★ ★

The business will be continued as heretofore by his son, **Robert V. Chambre,** who has been active in the conduct of the company's affairs for many years.

Norton Moves Los Angeles Office

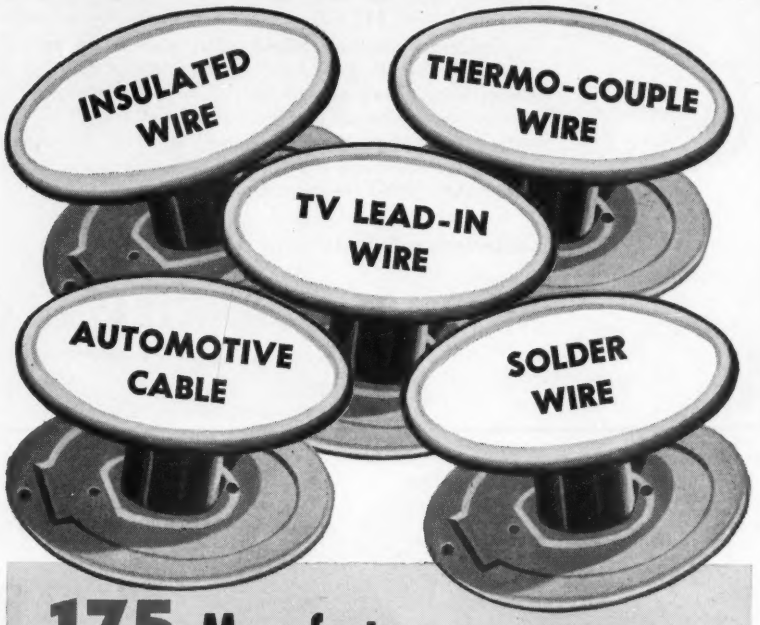
The Los Angeles District office of **Norton Company** has moved to 5905 Pacific Boulevard, Huntington Park, California. The telephone number is Logan 5-8195.

★ ★ ★

The old address was 4890 South Alameda Street, Los Angeles. **Robert W. Cushman** is the company's West Coast District Manager.

Orban Moves Jones to New York

Harold W. Jones, vice president and general manager of the Cleveland branch of **Kurt Orban Co. Inc.,** has been elected executive vice president and transferred to the home office of the company in Jersey City, N. J., where he will be in charge of sales of oil country tubular goods and will co-ordinate import and export activities of the steel division.



175 Manufacturers say MASON Spools are best—for less!

These manufacturers specify Mason lightweight, non-returnable, lithographed Spools for performance, appearance and cost!

And while Mason Spool performance speaks for itself, the appearance of Mason Spools speaks for *you* with rich, colorful lithography that assures *instant brand recognition.*

Mason lightweight, non-returnable Spools are available in 5″, 6½″, 8½″ and 10½″ head sizes. All sizes are available with 1⅞″ (Dia.) barrels. The 10½″ head size is also available with a 3½″ (Dia.) barrel. Barrel lengths from ⅝″ to 14″.

Let us know about your spool requirements *now!* Telephone East Providence 1-2810 or write to the address below.

MASON CAN COMPANY

1949 Dexter Road, E. Providence 14, R. I.
Branch Plant — Greenville, Ohio

INVINCIBLE Chain-Link Fence Machines • Greatest Profit Makers in Wire Fencing!

"BELIEVE IT OR NOT" — HERE ARE THE FACTS

The new "Applicator" (which is not a tension device) uses a well supported, but 1/8" thinner blade. Each wire gets two half-turn bends making a full turn per mesh. So the pair of wires feeding take 1/8" x 3.1416 x 2 = .7854" less wire for each revolution of the blade. This is 25/32" saving (or over ¾").

The Invincible on a medium speed of 600 rpm., with "cut-off" time deducted, will give that saving on 480 revs. per minute and this makes 375" or 31 feet. Taking actual running time at 50 minutes in the hour, the saving is 1,550 feet or 89.6 pounds of No. 9 wire and at 7 cents the Invincible saves $6.26 per hour of operation. In one year, of 250 eight hour days, this would total $12,500.

The Invincible gives a straight sided mesh using very slight tension. It also prevents wire slippage while bending over the blade edge at the first point of wire contact, thus reducing that special wear. Every one of the Invincible's "ancestor" machines is still operating after 18 years service. The Invincible is good for a long, long life. For over 40 years except in the wars, Germany has supplied the U. S. A. with most of the Chain-Link Machines in use here. Now we are sending the Invincible right into the Germans' European Sales Field and that at a higher cost to the user, WHY?—Invincible superiority.

Write for descriptive literature, or come and see it in operation—seeing is believing.

ARTHUR BLASHILL & COMPANY

Temporary Office: 78 Downing Street

WORCESTER 10, MASSACHUSETTS, U. S. A.

(ILLUSTRATED)
42" x 20" x 21"—(4000# cap.)

HEAVY DUTY BREAK-DOWN REELS

1000#
2000#
4000#
} capacities

Rugged Design including patented DURA-CURL rim, and many other features necessary to provide the *Strength* and *Durability* needed for continued successful performance.

Also complete line of sizes of Modern High Speed Wire Drawing NO-CREV Spools and Reels for both fine and intermediate size wire.

Mossberg PRESSED STEEL Corporation

18 WEST ST., ATTLEBORO, MASS., U.S.A.

Telephone Attleboro 1-0848

James Day (Machy) Ltd.
28 Maddox St.
London W.I. England

#103

Harry W. Finnell, Jr.

Phelps Dodge Copper Products Corporation has announced with profound sorrow the death of its Pacific Coast Sales Manager, **Harry W. Finnell, Jr.**, on Thursday, April 21, 1955, at Pasadena, California.

Joseph F. Miller Named Managing Director of NEMA

The appointment of **Joseph F. Miller** as Managing Director of the **National Electrical Manufacturers Association** was announced on May 5th by **A. F. Metz,** President. Mr. Miller, who has been Assistant Managing Director since August 1, 1954, succeeds **William J. Donald,** who retired April 30, 1955.

★ ★ ★

Mr. Donald served for twenty-one years as Managing Director, having first come to the Association in May of 1934. Under his guidance, the Association has grown in size and prestige and now has 571 members, numbering among them almost all the major manufacturers of electrical products. Because of his outstandingly successful career, he has been generally regarded as the Dean of Trade Association Executives.

★ ★ ★

Before coming to NEMA in August, 1953, as Recording Secretary of the Wire and Cable Section, Mr. Miller had been serving as Director of the Copper Division, Metals and Minerals Bureau, of the National Production Authority, Department of Commerce, since September of 1952. He was appointed Deputy Director of the Copper Division on July 9, 1952, and also served in the capacity of Deputy Assistant Administrator of the Metals and Minerals Bureau.

Joseph F. Miller

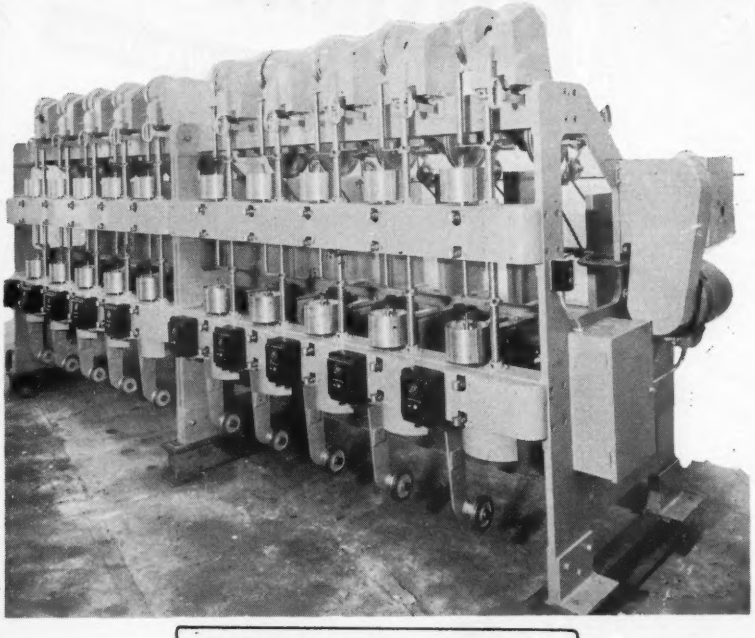
★ ★ ★

From 1942 to 1946, Mr. Miller was counsel for Defense Plant Corporation, a subsidiary of the Reconstruction Finance Corporation. In 1946, he was appointed Director of the Legal Division, Regional Office for Real Property Disposal of the War Assets Administration, but resigned to reenter private law practice the same year.

★ ★ ★

Born in New York, N. Y., in 1907, Mr. Miller is a graduate of Princeton University and Harvard Law School. He was admitted to the New York State Bar in 1932, and immediately engaged in private law practice in New York City.

2D-10-MBB INSULATION WINDING MACHINE No. 1129



APPLIES DOUBLE COVER TO 10 LINES OF WIRE SIMULTANEOUSLY. NOMINAL WIRE RANGE #15 TO #25 B&S GAUGE (.057" TO .018" or 1.450MM TO .455MM). STANDARD CAPSTANS 8" DIAMETER. SUPPLY WIRE LETOFFS AND TAKE-UPS ARE AT REAR OF MACHINE NOT SHOWN. MACHINE CAN BE ARRANGED SPECIAL WITH 12" DIAMETER CAPSTANS FOR HEAVIER WIRES.

ESTABLISHED IN 1855
1955 IS OUR CENTENNIAL

EST. 1855 AIMCO INC. 1915
"American" AIM INSULATING MACHINERY COMPANY
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FAIRHILL AND HUNTINGDON STREETS
PHILADELPHIA 33 PENNSYLVANIA U.S.A.

THE BEST FOR COVERING...

The **POURTIER** *High-Speed*

INDIVIDUAL INSULATING MACHINES

INDIVIDUAL HEAD, handling wire sizes of 7 to 32 A.W.G. Other models made with up to four (4) serving bowls.

POURTIER MACHINES will serve cotton, paper, cambric, fiberglas, silk, nylon and cellulose acetate at speeds of 4500 r.p.m.

EQUIPPED WITH:

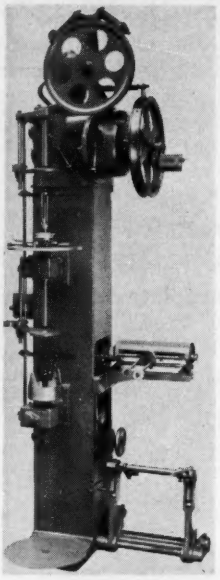
9 speed gear box for the haul-off capstan, automatic central lubrication and slow starting mechanism. Speeds easily changed. Bowls with compensator controlling the unrolling of the bobbin and a quick stopping device, in case of breakage of insulating material. Special control to change the direction of the motion of the heads. Traverse motion's speed and displacement easy to set up.

Machines are built to meet AMERICAN STANDARDS

SHORT DELIVERIES — LOW PRICES

POURTIER MACHINES

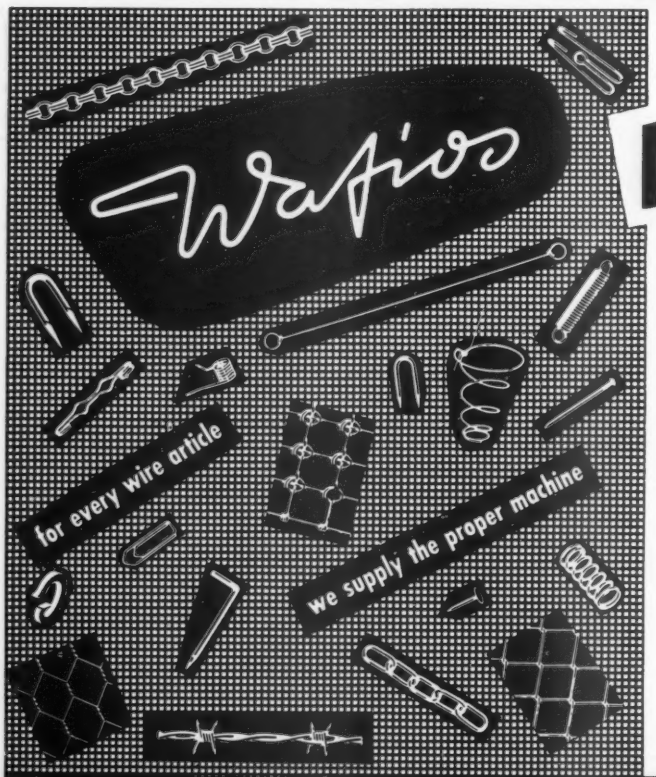
153 RUE GALLIENI, ROMAINVILLE-SEINE, FRANCE



INSULATING MACHINE IM 402

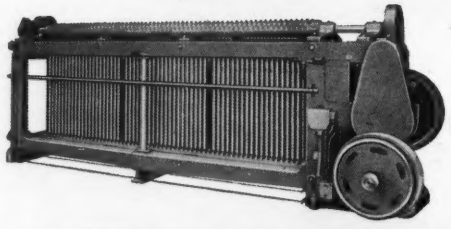
For the U. S. exclusively for I. M. Machines, address inquiries to FIDELITY MACHINE CO., Inc. Philadelphia, Pa.

For other machinery, send inquiries to POURTIER MACHINES. See address at left.



AUTOMATICS

FOR THE WIRE TRADE



HEXAGONAL WIRE NETTING MACHINE MODEL SF

We produce this model in different sizes for the manufacture of netting from 3/8" to 4" mesh and for netting width of 5' 1½ to 11' 1¾".

Sole Agents: Kurt Orban Co., Inc.
34 Exchange Place, Jersey City 2, N. J.

WAFIOS MASCHINENFABRIK REUTLINGEN 3 /GERMANY

A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50¢ for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,705,509, MACHINES FOR MANUFACTURING WIRE FABRIC, patented April 5, 1955 by Joseph Anthony Wakefield, Wrotham, England, assignor to Durafencing Limited, London, England, a registered British company.

Most specifically, the invention resides in a knuckling mechanism for operation, in conjunction with a movable anvil, upon the ends of a wire fabric.

★ ★ ★

No. 2,705,600, MACHINE FOR WINDING WIRE FABRIC, patented April 5, 1955, by Joseph Anthony Wakefield, Wrotham, England, assignor to Durafencing Limited, London, England, a registered British company.

For winding wire fabric into a roll, the inventor provides an arm for stepwise drive of a winding spindle, with a sleeve slidably mounted on the arm for axial movement thereon, a shoe mounted on the sleeve for pivotal movement about an axis perpendicular to the longitudinal axis of the arm, this shoe being adapted to engage and rest on the periphery of the roll of fabric as it is wound on the spindle; and driving mechanism connected to the sleeve for imparting oscillating motion to the arm.

★ ★ ★

No. 2,705,735, ELECTRICAL CONDUCTORS, patented April 5, 1955, by E. Mark Wolf, Rome, N. Y.

A method of forming a cable having means of identification and including at least one conductor and one insulation covering is disclosed, which comprises recording on a magnetizable wire a record of information relating to the cable and combining the wire with the conductor within the confines of the insulation covering.

★ ★ ★

No. 2,705,914, QUICK REVERSIBLE WIRE BINDING MACHINE, patented April 12, 1955 by Albert E. Cranston, Sr., Oak Grove, Oreg., assignor to Cranston Steel Strapping Co., Oak Grove, Oreg., a corporation of Oregon.

There are forty-one claims to this patent which discloses a reversible rotary carrier for laying a band in opposite directions about a bundle in successive operations, driving means for the carrier, this carrier being rotatable when the driving means is inactive, and a resilient member arranged to initiate rotation of the carrier while the driving means is inactive.

No. 2,706,064, WIRE CRATE HAVING A STACKING MEANS, patented April 12, 1955 by Viktors Vitols, St. Paul, Minn., assignor to John Wood Company, New York, N. Y., a corporation of Delaware.

The crate is constructed of stout wire and includes a construction whereby when the crate is on a conveyor, stacking means for the crates may be engaged automatically at approximately the longitudinal center line of the crate by a crate propelling device carried by a driven chain positioned in the middle of the conveyor system.

★ ★ ★

No. 2,706,404, SPRING TESTING APPARATUS, patented April 19, 1955 by Ervin E. Schiesel, Meriden, Conn., assignor, by mesne assignments to The Torrington Manufacturing Company, Torrington, Conn., a corporation of Connecticut.

Coil springs may be tested by this apparatus for tension and compression. There are five claims.

★ ★ ★

No. 2,706,501, GARMENT HANGER FORMING MACHINE, patented April 19, 1955 by Claude M. Townsend, Huntington Park, and Eldon M. Wilson, La Canada, Calif., assignors to Garment Hanger Co., Los Angeles, Calif., a partnership.

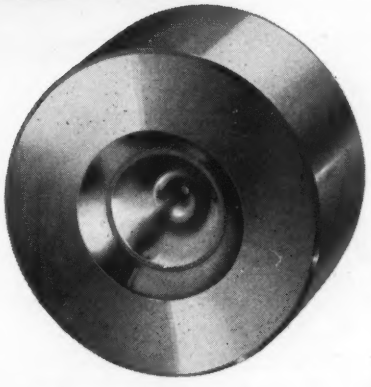
Wire garment hangers are formed by the machine which is covered in the patent by nineteen claims.

★ ★ ★

No. 2,706,625, APPARATUS FOR

WILLEY'S
TUNGSTEN CARBIDE

METALS
DIES
TOOLS
for the Wire Industry



Rough Cored Standard Dies
(from stock)

ROUND SQUARE HEXAGON OCTAGON

Rough Cored or Finish Ground
(Immediate quotations on receipt of your prints—
Fast delivery schedules)

SPECIAL DIES WEAR PARTS MANDRILS
NIBS—HEADING AND EXTRUSION DIES

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CAMDEN WIRE CO., INC.

Wire Fabricators

BARE OR TINNED COPPER WIRE AND STRAND

GALVANIZED STEEL WIRE AND WIRE ROPE

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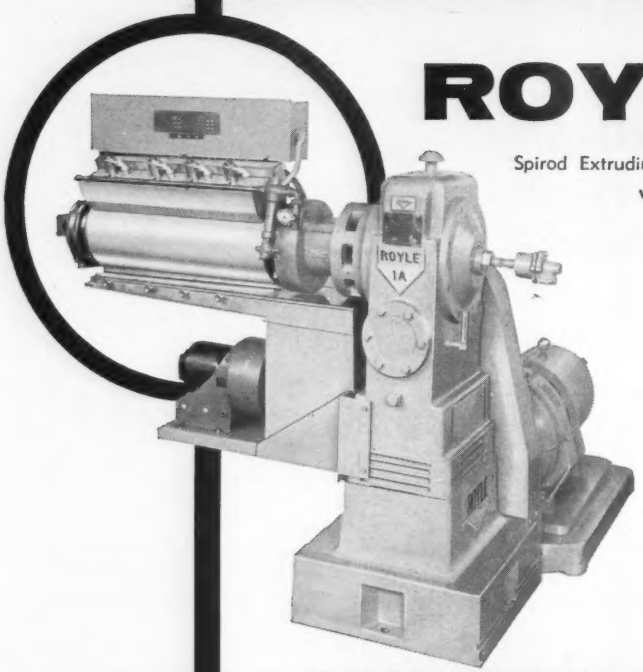

ROYLE 1A (2½" cylinder bore)

Spirod Extruding Machine with electric heating and high velocity evaporative cooling. An all-purpose extruding machine for processing rubber and plastics.
Available in sizes 1⅛" through 12" cylinder bore.

Strainers, Cooling Troughs, Light Wire and Cable Capstans, Motorized Take-ups, Temperature Control Units.

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

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London, England — James Day (Machinery) Ltd. — Hyde Park 2430 - 0456
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Akron, Ohio — J. C. Clinefelter — SWandale 4-5020
Los Angeles, Cal. — H. M. Royal, Inc. — LOgan 3261

CONTINUOUSLY CENTERING A MOVING STRIP, patented April 19, 1955 by Edwin T. Lorig, Pittsburgh, Pa., assignor to United States Steel Corporation, a corporation of New Jersey.

There is provided two series of narrow-bodied rolls in different planes arranged in staggered relationship so that the strip passes thereover in a tortuous path, each of the rolls having a cylindrical strip supporting surface of considerable less width than the width of the strip, the strip passing successively around the rolls so that the amount of the wrap of the strip around the rolls will be sufficient to change the direction of travel of the strip, the strip being unconfined laterally as it passes between the narrow-bodied rolls.

★ ★ ★

No. 2,706,636, WIRE GOLF TEE, patented April 19, 1955 by Frank Manino Bono, Sonora, California.

The tee comprises a pair of wires having circular bight portions and legs at opposite ends of the bight portions, the legs of the two wires being twisted upon each other to define a shank portion terminating in a point adapted to be inserted into the ground, with the bight portions projecting laterally outwardly from opposite sides of the shank portion at the end thereof remote from the point so as to define a golf ball-receiving saddle.

★ ★ ★

No. 2,707,017, METHOD OF MAKING WIRE REINFORCED FLEXIBLE HOSE, patented April 26, 1955 by Charles H. Beare, Stanley R. Carson, and Russel L. Monbeck, Dayton, Ohio, assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware.

This method comprises continuously forming a wire into a helix, advancing the helix axially from its forming station, passing a moving portion only of this helix, through an extrusion aperture from a plastic extruder, continuously extruding a tape of plastic materials through the aperture and around the helix, and then continuously wrapping the thus formed wire reinforced tape in overlapping turns for forming the hose.

★ ★ ★

No. 2,707,026, WIRE CUTTING MACHINES, patented April 26, 1955 by Joseph H. Hoern, Saginaw, Mich., assignor, by mesne assignments, to Joseph Gogan, Cleveland, Ohio.

In a wire cutting machine the inventor provides a pair of adjacent members one being a carrier movable about a fixed axis and having an axial opening therein in eccentric relation to the fixed axis and the other member having a shearing surface presented toward the carrier and a feed passage adapted to accommodate a wire to be cut and opening through the shearing surface at a point opposite the path of movement of the opening, a cutter in the form of a pin disposed in the opening and having an end face slidable on the shearing surface, and a drive operable to actuate the carrier about the fixed axis for causing repeated movement of the end face of the cutter in shearing relation across the feed passage for shearing successive segments from the wire.

Hand Machine Speeds Up Tool Makers Work

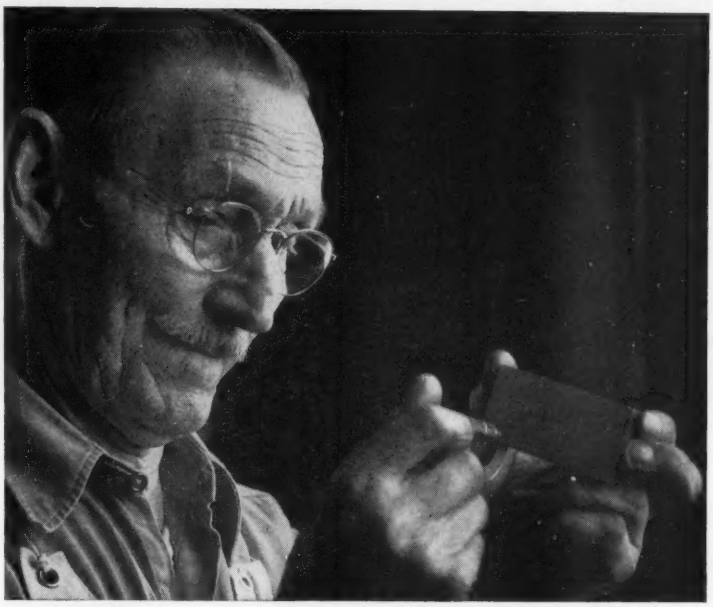
This tool is fully described and illustrated in a new brochure. It is known as the Original Di-Profiler and it is a hand tool that mechanically scrapes, hones, mills, files, polishes, saws, laps, grinds and engraves with a minimum of effort on the part of the tool maker. It is claimed to operate 50 to 100 times faster than can be accomplished by any other hand means.

★ ★ ★

The folder illustrates more than a dozen different applications of this precision tool and illustrates the numerous accessories that make a tool and die maker's job easier. With this complete die filing equipment, as provided by **Nord International Corp.**, any tool maker can accomplish the work that has heretofore required him to make many special tools and he can do it at least 50 times faster because the "elbow grease" factor has been eliminated.

★ ★ ★

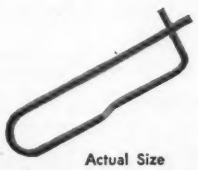
Write to Nord International Corp., 449 W. Central Ave., Orange, N. J.



I've been making tools for wire and ribbon metal forms long enough to know that A. H. Nilson Fourslides are the most adaptable and produce parts most economically. For easy set-up and tool adjustment, accurate feed, and rugged design . . . Nilson Fourslides are my choice.

Look at the part shown on the left . . . made in our Nilson #S-O Fourslide. Better than 5,000 of these are produced per hour *automatically* from coiled stock using .039 dia. tin-plated copper wire, and this tops any previous production method.

I'd suggest you contact Nilson yourself and learn how you can increase production and lower costs with Nilson automatic Fourslides.



Actual Size

A.H. NILSON MACHINE COMPANY

1516 RAILROAD AVENUE, BRIDGEPORT 5, CONN.

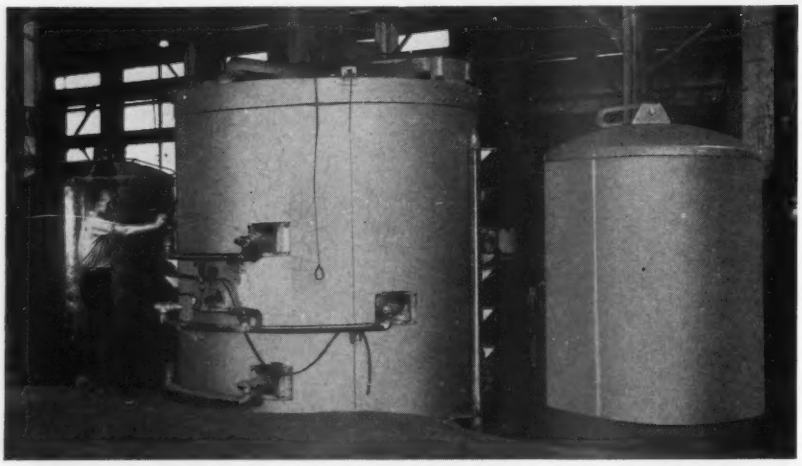
Automatic Chain Making Machines : Staple Forming Machines : Wire and Stock Reels : Wire Straightening Equipment : Slide Feeds for Presses

Folder Gives Facts on Two Philips Microscopes

A new 4-page folder titled "Some Reasons Why The Norelco 20 and 75 Angstrom Electron Microscopes Deserve Your Consideration" is available gratis from the Research & Control Instruments Division, **North American Philips Company, Inc.,** 750 South Fulton Avenue, Mount Vernon, N. Y.

★ ★ ★

Forty-four typical applications are listed together with design and operating information on the large EM-100 instrument and on the smaller EM-75 unit. Data covers accelerating potential, magnification, transmission electron diffraction, reflection electron diffraction, focus determination, resolution, viewing screen, 35 mm and front-end plate cameras, stereo pictures and power facilities.



Bright Annealing Wire Uniformly in ROCKWELL BELL FURNACES

In this Rockwell installation four furnace bases and one gas fired, bell type furnace provide the required operating flexibility of heating, loading and unloading the work. Each base is equipped with a circulating fan to distribute heat uniformly to the charge.

A steel hood is placed over the work and sealed tight. The load of copper product is bright annealed in a protective atmosphere and cooled in the hood.

ROCKWELL ALSO BUILDS
Batch and continuous furnaces and ovens for annealing, aging, drying, enameling, tinning, glass coating, synthetic coating. Atmosphere generators.

Rockwell bell furnaces (cylindrical or rectangular) are built to specifications for bright annealing steel and non-ferrous wire in coils or on spools.

Write for Bulletin 432 on Rockwell Wire Mill Furnaces.

ROCKWELL SINCE 1888 BUILT

W. S. ROCKWELL COMPANY
FURNACES • OVENS • BURNERS • VALVES • SPECIAL MACHINERY
2425 ELIOT STREET • FAIRFIELD, CONN.
Sales Representatives in Principal Cities

New York Regional Meeting of The Wire Association

(*Continued from page* 685)

year, under the skilled direction of **Bill Wells**—that of giving guests an opportunity to sign up for membership at the time of registration. Nearly 20 people took advantage of the service. The registration table was presided over by Mr. Wells and members of the committee, who rotated their time so that any one spent only an hour taking applications for membership.

★ ★ ★

The Program Committee to whom we are in debt for this fine showing and for the splendid representative program of top-notch papers and events was:

General Meeting Chairman
DAVID M. SCHMID, Pres., Techalloy Co., Inc., Rahns, Pa.

Program Committee Chairman
CLEMENT C. LAWSON, Plant Facilities Engineer, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

Assistant Chairman, Ferrous Section
WILLIAM D. BAWDEN, Works Manager, The Gilbert & Bennett Manufacturing Co., Georgetown, Conn.

Assistant Chairman, Insulated Wire Section
JOHN H. IGMANSON, Vice President, The Whitney Blake Co., Hamden, Conn.

Assistant Chairman, Bare Wire Section
RALF L. HARTWELL, Vice Pres., Metal Textile Corp., Roselle, N. J.
Assistant: LEON SALZ, Mgr., Lubricants Div., Magnus Chemical Co., Garwood, N. J.

Chairman, Banquet and Hotel Committee
FRANK E. HARDEN, Pres., Camden Wire Co., Camden, N. Y.

Chairman Plant Visits Committee
CHARLES O. BRUSTELE, Vice Pres., Chg. Engineering, Syncro Machine Co., Perth Amboy, N. J.
Assistant: EMIL DERN, Pres.

Kelly Wire Die Corp., New York, N. Y.

Chairman Membership Registration Committee

WILLIAM L. WELLS, Field Engineer, Reilly-Whiteman-Walton Co., Conshohocken, Pa.

The Directors' Meeting

The regular semi-anuual meeting of the Board of Directors of the Association was held on Wednesday, April 27th, the day preceding the Regional Meeting. With 16 directors in attendance, the meeting was called to order at 2:30 P.M. by President **Leslie C. Whitney.**

★ ★ ★

The minutes of the previous meeting were read and duly approved, and the report of Secretary-Treasurer was presented and unanimously accepted.

Medal Award for 1954

Allan B. Dove, Chairman of the Medal Award Committee, reported that based on the Oxford system, selections from 1954 papers published in Wire and Wire Products had been made as follows: The Medal Award to **Norman A. Wilson,** Assistant Director of Research, **Morgan Construction Company,** Worcester, Mass., for his paper "The Cooling of Steel Wire During Continuous Wire Drawing", and a Certificate of Honorable Mention to **Donald K. White,** Foreman, No. 2 Wire Mill, **John A. Roebling's Sons Corp.,** Trenton, N. J., for his paper "Continuous Patenting, Cleaning and Coating." There was no award for non-ferrous papers.

Nominating Committees Appointed

President Whitney submitted his appointments for these committees for the coming year as follows: Nominating Committee for Directors: **Tom M. Girdler, Jr.,** Chairman, and **Fred M. Crapo** and **Richard E. Brown,** members; Nominating Committee for Officers: **Leonard C. Crewe, Jr.,** Chairman, and **Earl R. Potter, John L. Sanderson** and **Richard E. Brown,** members; Nominating Committee for the Executive Committee: **Grayson B. Wood, Jr.,** Chairman, and **Benoit J. Sirois, Frank R. Nichols** and **Richard E. Brown,** members. Nominations for directors will be submitted to the Association membership by letter-ballot.

Other Actions Taken

Earl R. Potter was called upon to make a report on plans for the Regional Meeting to be held in San Francisco on June 10th, of which **William Mohr,** Wire Mill Supt., **Colorado Fuel & Iron Corporation,** South San Francisco, is Program Chairman, closing with an invitation to those present to attend the meeting.

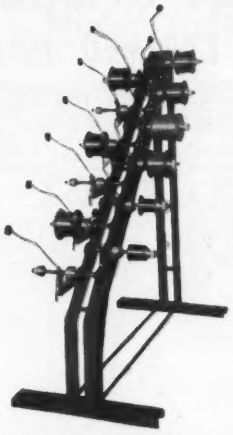
★ ★ ★

John A. Moritz, General Program Chairman for the Annual Convention, to be held in Chicago in November, reported that his committees had arranged for approximately nine papers each for the ferrous and non-ferrous groups.

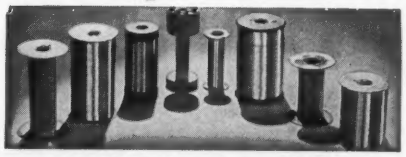
STANDARD UNI-DRIVE WIRE WINDER

INCREASE YOUR PRODUCTION WITH THIS WINDER

Wire Winder



Pay-off Attachment



Various types of supply packages that may be wound on Standard Uni-Drive Wire Winder.

PAYOFF

Our payoff attachment is made with self-aligning ball bearings and a compensating attachment to control the tension of each end. Applies same tension when spool is empty as when full.

The new Uni-Drive Winder with Payoff Attachment is new in design and incorporates several improved and tested features. Production is stepped up through increased speed. It produces smooth, even and accurately wound spools of wire in single or multiple ends. All strands parallel—no over or under-winding. Automatic Stop-Motion controls each strand. Compensating attachment produces perfectly controlled tension. Traverse adjustable from 1¾" to 5½" between spool heads without changing cam. Designed especially for winding wire to be braided and shielded for electrical conductors up to ¾" diameter.
Payoff can be equipped with Carboloy Guide Inserts at additional cost.

STANDARD MILL SUPPLY COMPANY
PAWTUCKET, RHODE ISLAND, U.S.A.
1064-1080 Main St.
PAwtucket 3-1534 — 3-1535 — 3-1536

David M. Schmid, General Meeting Chairman of the New York Regional Meeting presented a report on papers, expected attendance, estimated income and expenses for the current meeting in New York.

★ ★ ★

In the absence of **Eber J. Hubbard,** Chairman of the Entertainment Committee, Mr. Brown reported that a good show for the Smoker-Dinner was being put together that would cost some $500 less than the 1954 show.

★ ★ ★

A report was made by Mr. Brown on the proposal made by a number of smaller electric wire manufacturers to organize a separate organization. The directors voted negatively on the suggestion and instructed Mr. Brown not to proceed with it.

★ ★ ★

Discussion of the work of the standing Committee on Wire Specifications was held. As the directors felt that the Committee had served the purpose for which it was formed, it was voted to dissolve the committee with the thanks of the Directors for their fine services.

★ ★ ★

As a result of a meeting with the officers of the Electric Wire and Cable Committee of NEMA it was agreed that so long as The Wire Association operated as a production organization as specified by its Constitution and By-Laws NEMA would cooperate in every way to assist in making our operations successful.

★ ★ ★

After some discussion, a motion was made and adopted to present those who have served as President of the Association with suitable certificates expressing appreciation of their labors in behalf of the Association.

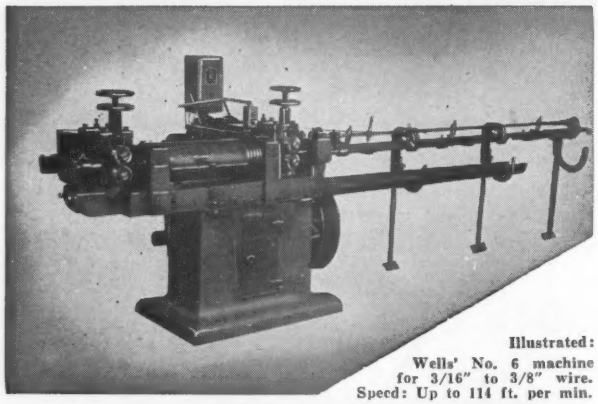
★ ★ ★

This meeting was adjourned at 4:40 P.M.

60 Years of Experience Making

WELLS STRAIGHTENERS & CUTTERS

HAVE EVOLVED MACHINES FAMOUS FOR THEIR



Illustrated:
Wells' No. 6 machine
for 3/16" to 3/8" wire.
Speed: Up to 114 ft. per min.

DEPENDABILITY, SPEED and ECONOMY.

PREFERRED WHERE CONTINUOUS PRODUCTION AND ACCURACY ARE FACTORS OF IMPORTANCE.

FULLY TIME-TRIED.

The WELLS NO. 6 shown above cuts wire in any lengths from 7½" up to 25'. Flier runs on ball bearings. Gears and motor drive enclosed in base and accessible through a door.

Long noted for sturdiness, accuracy and reliability, WELLS STRAIGHTENING AND CUTTING MACHINES are noted for their ability to stand up on even the most trying and difficult jobs.

WELLS machines are built in a full range of models to handle all sizes of wire. They are the result of continuous improvements over the years and will serve you well.

Send for Catalog covering the full line.

Frank L. Wells Company

KENOSHA • 5821 Fifth Avenue • WISCONSIN

Builders of Fine Wire Working Machinery

New Brass Mill to be Built In Los Angeles

Plans for construction of a $13,000,000 brass mill in the Paramount district have been announced by **John A. Coe, Jr.,** of Waterbury, Conn., **American Brass Company,** president.

★ ★ ★

He coupled it with a prediction at a Chamber of Commerce-sponsored luncheon in the Statler, that "the Los Angeles area will shortly become the nonferrous metals center of the West."

★ ★ ★

Mr. Coe said his company, a wholly-owned subsidiary of Anaconda Copper Mining Company, decided to build here because "with the rapid industrial growth of the West Coast area, we need a basic mill to serve our customers efficiently and economically."

★ ★ ★

Construction, it was stated, may start in the Spring if engineering detail can be completed by then, and a plant probably will be in operation within two years.

★ ★ ★

Mr. Coe estimated an annual

SIX ADVANTAGES from just ONE DIP!

COAT WITH BORAX 5 MOL.

Here are the advantages you get when your stock is Borax-coated...

1. FASTER ACID NEUTRALIZING
2. LONGER DIE LIFE
3. FASTER BUTT WELDING
4. BETTER WORKING CONDITIONS
5. LONGER STORAGE SAFETY
6. RUST DOES NOT FORM

One dip puts on a Borax coat that is tight, yet pliable, and dries in a few minutes. It provides a good vehicle for your drawing lubricant and won't flake off. Borax-coated rods are a lot cleaner to handle in transit and are protected from rust while in storage. Try BORAX or BORAX 5 MOL on *your* stock!

Send for your copy of:
BORAX BULLETIN No. 2WD

PACIFIC COAST BORAX CO.
DIVISION OF BORAX CONSOLIDATED, LIMITED
NEW YORK • CHICAGO
LOS ANGELES • CLEVELAND
PHILADELPHIA

MANUFACTURERS OF FAMOUS "20 MULE TEAM" PACKAGE PRODUCTS

capacity will approximate 30,000 pounds, and that 500 locally-recruited workers will be employed.

★ ★ ★

The one-story building, which will have 330,000 square feet of floor space, will be situated on 47 acres located easterly of Garfield avenue and northerly of Compton boulevard.

Reprints Available

Reprints of an article entitled "Continuous Patenting, Cleaning and Coating of Steel Wire," may be obtained by writing to **The Gas Machinery Company,** Industrial Furnace Division, 16100 Waterloo Road, Cleveland, Ohio.

★ ★ ★

This article, written by **Donald K. White** of **John A. Roebling's Sons Corporation,** gives a very comprehensive review of revolutionary changes in patenting, cleaning and coating processes for steel wire, as introduced in that firm's plant. It is an unbiased review and emphasizes many phases of this process besides the heating furnace and should be a good addition to anyone's library.

★ ★ ★

In writing to The Gas Machinery Company, please refer to Bulletin A-105.

New Plasticizer Produced

Celanese Corporation of America has begun semi-commercial production of a new fire retardent plasticizer, Celluflex CEF (tris B-Chlorethyl phosphate), **Richard W. KixMiller,** General Manager of the Chemical Division of the Company, has announced. Produced at the Newark, New Jersey, plant of the Division, the material is currently available in drum quantities.

★ ★ ★

Celluflex CEF gives unique fire retardent properties to a variety of molded and extruded plastics and surface coatings including vinyls, cellulose acetate, ethyl cellulose, nitrocellulose, butadiene-acrylonitrile copolymers, rubber chloride, etc., where its clear-water-white color permits its use in transparent and pastel shaded items.

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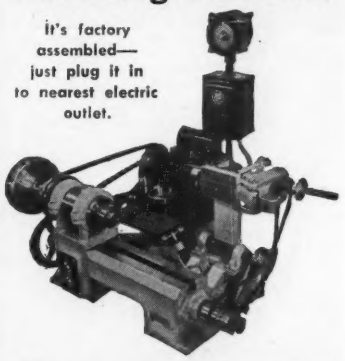

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PA.

Repair of Thermoplastic Cable Jackets Using Hot Gas Welding

(*Continued from page* 680)

being welded or inclined away from the direction of travel. With a plastic strip, the pressure is obtained by rolling with a rod as shown in Figure 11.

* * *

The rate for welding is dependent upon several factors; the material being welded, the thickness of the jacket, the size of the filler rod, the experience of the welder, and the appearance desired. Welds which are made too rapidly will probably be weak and unreliable because of insufficient bonding. If the plastic is not heated enough to cause sufficient coalescence, only a thin section of material will be joined, resulting in a weak bond. A poor bond can be detected readily by an experienced welder.

* * *

Dressing of a repaired section, if desired to improve the appearance, can be accomplished by heating the irregular surfaces with a weaving motion of the torch and rolling the area with a smooth metal rod while the surface is soft. This will not weaken the weld. Dressing the weld by trimming with a knife is not desirable since this would tend to reduce the strength of the welded area.

* * *

The types of welds most generally used to repair jackets are either a V-Butt or Strip Weld.

* * *

A V-Butt Weld is usually used to repair jackets having heavy walls. The procedure is as follows:

1. **Clean the area to be repaired using either a file, wire brush or emery cloth.**
2. **Bevel the edges of the injured area and taper the ends using a sharp knife. Figure 5.**
3. **Cut the end of the filler rod at an angle of approximately 30° and weld into the base of the beveled section as illustrated by Figure 6. If one piece of filler rod does not fill the cavity, weld in additional pieces of rod. Figure 7.**
4. **Dress the weld by applying heat and rolling with a smooth metal rod as the material is softened. Figure 8 illustrates the position of gun and rod for dressing.**

Handwriting of a man about to discover

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Figure 9 shows a dressed weld.
Figure 10 shows a cross sectional view of a repaired jacket.

A Strip Weld is used either on jackets having thin walls or where the injury does not go completely through the jacket. The procedure is as follows:

1. **Clean and smooth the damaged area using either file, emery cloth or wire brush.**
2. **Cut strip slightly wider and longer than the damaged area.**
3. **Tack one end of the strip slightly beyond the end of the damaged section by heating the strip and jacket.**
4. **Apply heat to the strip and to the jacket and weld into place by rolling with a smooth metal rod.**
   Figure 11 illustrates the position of the rod, strip and torch.
5. **Dress edges of the strip by softening with heat and rolling with the metal rod. Figure 12 illustrates this operation.**
   Figure 13 illustrates a completed weld.
   Figure 14 shows a cross sectional view of a repaired jacket.

In summarizing, we can state that the technique of hot gas welding has proven itself to be reliable and satisfactory. Tests have shown the repaired areas to be either equal to, or stronger than, the original jacket since the welded section normally exceeds the original jacket in thickness. Thus, Hot Gas Welding provides both the manufacturer and user with a simple, reliable and economical method for repairing cable jackets, which might otherwise be scrapped or repaired at considerable cost of time and material.

References

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U. S. Patent No. 2,220,545.
(2) A. Henning—I. G. Farbenindustrie, Application May 1, 1938, Granted August 12, 1943.
D. R. P. No. 739,340.

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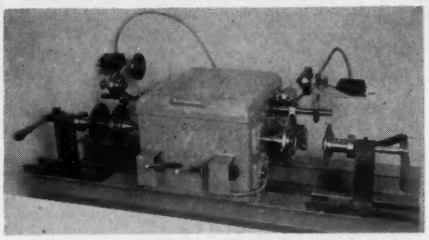

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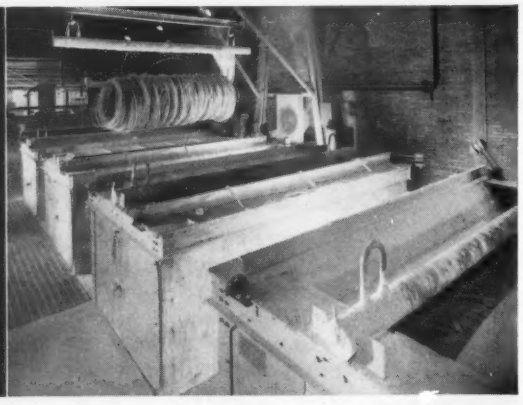

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World Supply and Price of Copper

(*Continued from page 676*)

world for increased copper supply. Fortunes have been poured into developing these mines and their peak production has yet to be reached. Exploration is also in its infancy and development only partially begun.

Canada

Canada in 1954 produced 303,000 tons, up twenty percent (20%) over 1953 when a strike in the Noranda mines had immobilized production for part of the year. This strike was settled in February, 1954, and 1955 production should even exceed 1954, barring further strikes.

Summary of the Supply Situation

The copper shortage has already lasted longer than most people expected or even thought possible. While I have attempted to keep statistics at a minimum in this paper, below is a chart which gives you my personal prediction of the supply picture for the next few years. The figures are self-explanatory. They have been gathered from many, many sources and are as reasonable an estimate as we can hope for. They definitely show that a net world surplus of copper will begin in 1955 and grow in 1956 and 1957.

★ ★ ★

Figures are necessarily estimated for future years and include those countries which report and are members of The Copper Institute plus those which do not report.

Prices

In discussing the present and future price of copper, remember, please, that many fundamental changes have taken place since World War II.

a. **The United States has become an importer of duty-free copper instead of an exporter with a four cent (4¢) tariff.**
b. **Currency restrictions exist in almost all countries of the world thus, also, restricting the trading in copper.**
c. **Governments have become interested in copper by stockpiling in the United States, by changes in**

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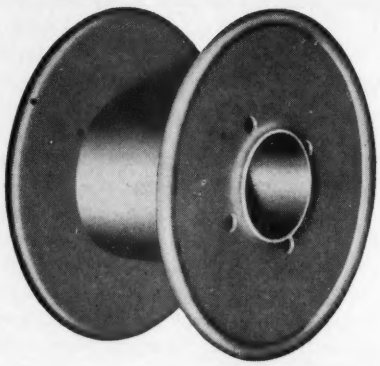

Industry's tireless search for greater efficiency is constantly posing new problems in high speed for the wire industry. This has underscored, as never before, the need for correct design and careful construction of reels for wire drawing machines.

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policy by countries like Chile which exists almost solely by copper exports, and by the high state of tension throughout the world, which causes Defense Ministries to keep a weather eye out on their copper supply.

d. Large increases in the use of copper have taken place in the electrical industry, and

e. There is an increasing importance throughout the world in the use of aluminum, plastic and other competitive materials in substitution for copper. The changes required by these things have required changes in the merchandising and sales promotion policy of the American copper producers.

★ ★ ★

There are many types of copper sellers in the United States and many ways in which they price their sales:

American Primary Producers set their own prices. Usually one sets the price and the others must follow to be competitive. The price had been thirty cents (30c) for more than a year until around February 1, 1955, when Anaconda, Kennecott and Phelps-Dodge raised the price to thirty-three cents (33c) within a few days of each other. At the end of March 1955, the price was further raised to thirty-six cents (36c). In setting their prices, the Primary Producers consider competition, costs and present as well as future demand.

★ ★ ★

American Custom Smelters and Refiners whose raw material is scrap as well as virgin metal, sell by contract. These contracts call for sales at the price in effect at the time of shipment, or at fixed prices, or at average price for the month as published in the Engineering and Mining Journal, known as "EMJ". In quieter times, they try to sell daily as much metal as they take in daily. They take no credit risks; you put up your money before the metal leaves their plants. They also sell abroad at the prices quoted on the London Metal Exchange, known as "LME".

★ ★ ★

American Sales Agents have grown in this country and market a great deal of copper especially for smaller mines. Granby, Inspiration, Copper Range, Butte, Miami, Magma and others use these sales

MIL-W-5086 WAS QUITE A PROBLEM

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And, of course, the wire manufacturer had to have a cable coating which could be easily applied.

We turned this many sided problem over to our competent laboratory staff.

We don't say it was the same day they came up with the perfect cable coating but they did have it in a comparatively short time.

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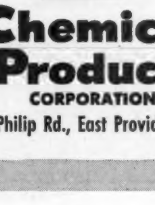
. . . and if you've found something of interest here, we'd like to hear from you.



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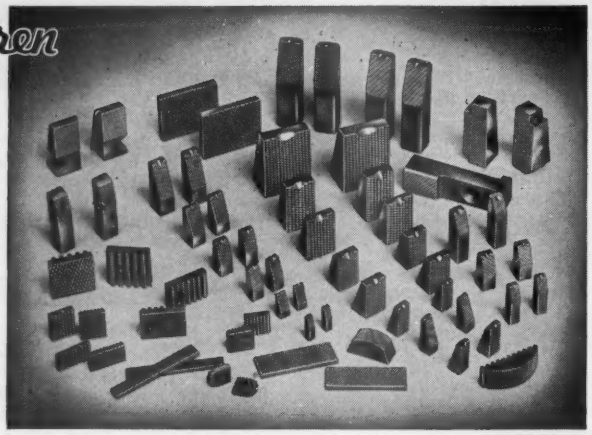

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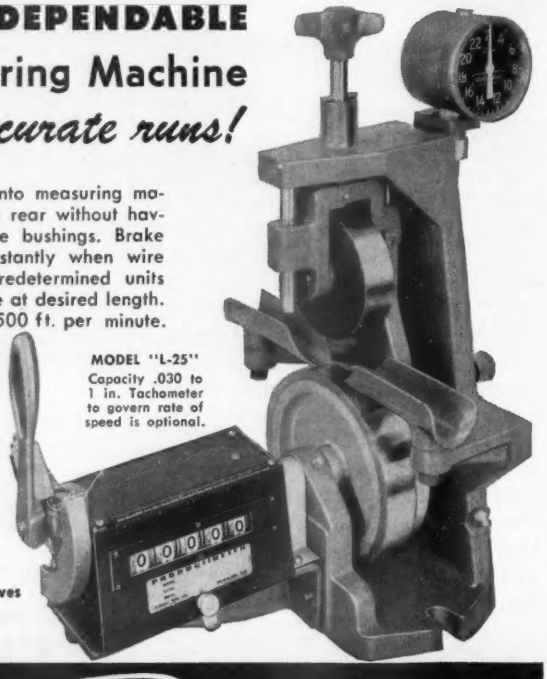

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agencies. Some of the agencies are subsidiaries of the Primary Producers, some producers own large stock interests in the smaller mines, some family groups have large interests in both the major producers, the sales agencies and the smaller mines — it is alleged to be one great happy, interlocking, interlaced, interwoven, interconnected, intermingled group — it's big business. Sales agencies sell by contract, by the individual lot, by the month and by the year. They sell EMJ, fixed price, price at the time of delivery and average EMJ for the month. They also sell LME Average and some of them sell for foreign mines, as well as domestic.

★ ★ ★

Foreign Producers sell in as many ways as there are to sell copper. Several large Rhodesian mines who used to sell at fixed prices have recently changed their policy to LME Average in view of the higher prices there and have announced that that is the only way they will sell in the future. Other South African mines still sell at fixed price and some are in favor of a stabilized price of some sort.

★ ★ ★

Chilean mines used to sell via the American Mine Owners — now they have set up a Copper Branch in their Banco Centrale. This clever group had charge of disposing of Chile's 180,000 ton pile up and did a splendid marketing job, even before the present enlarged demand. They sold the United States 100,000 tons for stockpile and marketed the balance without fixed policy, making every kind of deal that would produce the most money. They sold at price in effect at the time of shipment, LME, EMJ plus LME differential, fixed price, EMJ, fixed price with immediate credit for delivery 2-3 and 4 months hence, part fixed and part LME, and also at a minimum guaranteed price with settlement at LME index differential. Whether Chilean pricing will ever return to the monopoly of the American Producers is very doubtful, even though in the long run it would

probably help Chile develop a more stabilized economic situation.

★ ★ ★

Other countries use all of the above methods in selling and some use the Commodity Exchange in New York City. I might say a word here about future contracts on that exchange. While the contracts state that the basis is electrolytic copper, this copper can be in ingots, ingot bars, wire bars, cakes, slabs or billets. In addition the seller, at his option, may tender at the contract price either fire refined or lake copper. The seller may also tender at a slight discount copper cathodes or lower grades of fire refined copper in many different shapes. Further, the seller has the option to deliver at any one of a number of licensed warehouses, at many points in the United States, without freight allowance. Therefore, unless one wants to get into the business of being an expert in conversion he is quite likely to have to pay as much as two cents (2c) a pound extra to make sure he gets electrolytic wire bars. Obviously for the average wire and cable manufacturer these contracts, while fluctuating in general with the world price of copper, are not of much use in keeping a wire mill running.

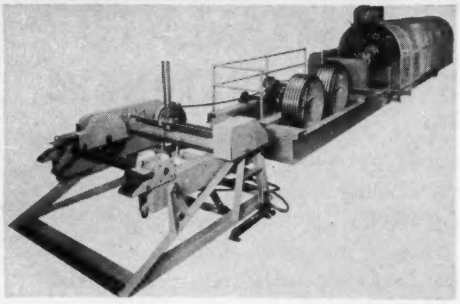
★ ★ ★

A fifth class of copper seller is the "Vulture". He performs no useful function but lives on the troubles of manufacturers who neglected to keep their inventories high enough to meet their customers' demands. He usually senses a copper shortage in the making, buys up metal as well as scrap and then charges the trade whatever price the traffic will bear for making nearby deliveries of the metal. During this recent shortage he plied his trade well and his prices were anywhere from six cents (6c) to twelve cents (12c) above the producer's prices — and he did sell a lot of copper.

★ ★ ★

For a long time now, and especially in the past six months, a battle of words has ensued over how copper should be priced — in

THREE-WIRE HEAVY DUTY TWISTING MACHINE



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Cradle reels either 30", 36" or 48" in diameter.

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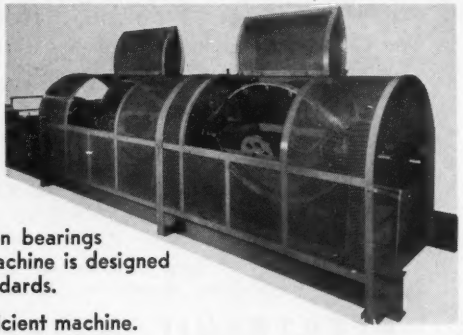

Capstans either single with fleeter sheave as shown or double with diameters of 30", 36" or 42". Rates of lay from 1½" to 36".

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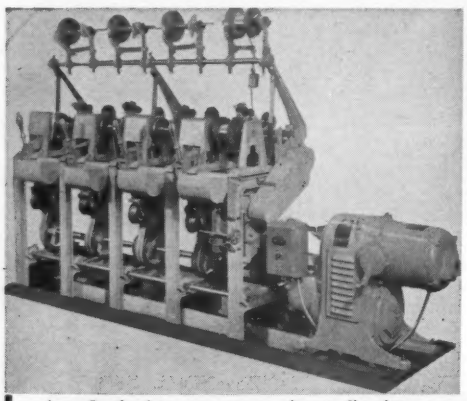

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Size Range: .010" to .080" or heavier if soft and many flat wire sizes.
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Capacity: usually 4 to 8 spindles.

The 1900-HV Spooler is a rigid, precision machine which will consistently produce a uniform, dense wire lay. Both the traverse and spindle drives are regulated through wide-range, stepless, variable speed units, eliminating change gears. The 1900-HV is completely adaptable to your particular constant or changing demands. All controls are positive. Adjustments are made accurately with the spooler in operation and without tools.

Both smooth acceleration and rapid stopping is obtained through a single lever at each station. Spool changing is simple and rapid. Anti-friction bearings are used on all shafting and spindles.

Your special requirements can be incorporated into the design. Each machine is delivered ready for operation from your power supply. Payoff stands furnished as extras.

Consult us on your spooling problems.

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31 East Runyon Street Newark 5, N. J.

a free and open market or as set by our Primary Producers.

★ ★ ★

To these Primary Producers in the United States who have kept a lid on the price in face of world prices which were as much as twelve cents (12c) higher, must go a great deal of credit for their reasoning. They know their costs, they know that from the long range point of view higher prices can only encourage competitive metals and plastics; they know that their future markets depend on keeping copper at a competitive price and they have acted accordingly. Nevertheless, it must be admitted that they have been unable to keep the American fabricator properly supplied at this selling price. Some of these Producers, who vociferously opposed OPA and OPS ceiling prices, have admitted this inability, by not only raising the price of copper six cents (6c) but also by raising the wire price, in March, 1955, to compensate for the premium priced copper they have had to buy.

★ ★ ★

On the opposite side is the perfectly valid argument that only a free and open market with free and open bidding and offering can produce a price which represents the sum total of world price opinion. The contention that this method produces violent fluctuations with each labor or political disturbance is cast aside by the contra-argument that at least a buyer knows what he pays for his copper and can price his finished product in accordance with that cost.

★ ★ ★

Those who favor a free and open market take the position that if the domestic price of copper were fluid instead of static, if the price were responsive to supply and demand instead of being artificially pegged, the chances are that the world price in London would be lower than it is and the domestic price would be higher. Under this system copper would flow to this country as well as to Europe and the domestic consumer would be getting all the copper he needed.

They further argue that a great many would hesitate to buy more than they actually need and this would prevent the hoarding that is supposedly going on.

★ ★ ★

The London Metal Exchange has often been called an unrepresentative market. I have visited it and despite the publicity I must remind you that it is open but twenty (20) minutes a day and one gets the impression that it is a much too limited operation to be the sole guide for world copper prices. For one thing the Spot Contract actually means copper then held in a warehouse. Thus a dock strike in London can run up the Spot Contract out of all proportion to its worldwide significance. I recently received a letter from the London Metal Exchange from which I quote: "The point to bear in mind is that The London Metal Exchange is essentially a hedging market, and the price of Copper is, therefore, not a true wirebar quotation but a price for the various grades which can be delivered against the standard contract in sellers' option. . . ." Likewise the Forward Contract is limited to three (3) months and thus provides an incomplete hedge, except over the short term. I, for one, a copper wire producer, would not be very anxious to see fluctuations of five cents (5c) a lb. because of local difficulties of London labor.

★ ★ ★

We all know that England must export to live. We also know that the export of commodities from the Commonwealth Colonies is the main source of English Export and of her dollar exchange balances. I must, in good conscience, give you my purely personal feeling that every time the United States gets involved in a commodity shortage, the price of which is influenced by England, we get the short end of the stick. Somehow, some way, the price winds up where we in the United States pay higher and higher for the commodity. Tin, cocoa and rubber are notable examples which I am sure you will remember.

★ ★ ★

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People have been heard to say that you can't sell any more metal at lower prices than at high ones. While this is undoubtedly true for the short term, it is undoubtedly false over the longer term. The higher the long term price the lower the long term usage of a commodity. Coal vs. Oil, Butter vs. Margarine, other energy foods vs. Potatoes are examples of things that have had a declining use in a growing economy for price and other reasons. Copper thus far, even with the high present demand, has not kept pace with the rate of growth of industrial production—the reason is that much of the new industrial activity is in electronics and aviation, which are great man hour users but relatively small raw material users.

★ ★ ★

My guess is that over the long range, producer set prices have the advantage despite the arguments of the opponents that the producers may be great miners and great engineers but poor marketers. The best thing for the wire industry is lower copper prices and the best way to compete with the inroads being made by aluminum is to keep the price of copper low and stable and the supply plentiful.

★ ★ ★

Therefore my considered opinion is that the ideal solution would be to use Producer set prices in this country for the bulk of the supply that American Producers can sell. In periods of shortage American Producers should buy foreign copper at above their own prices and pass this price on to the fabricators for that quantity of copper which these fabricators desire over and above the quantity they are entitled to by historical usage. Remember the thirty cents (30c) domestic and thirty-six cents (36c) foreign copper price in 1952/53 under OPS! This system worked out fairly well for the fabricator and his customer for they both knew it and understood it. You explained to the customer that you could allow him so many pounds at the domestic price and he could have whatever else he

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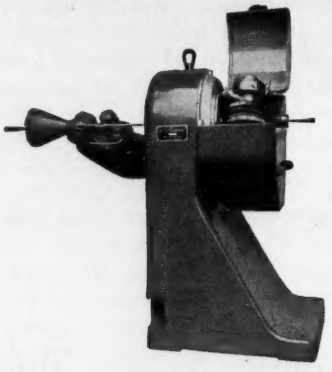

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wanted by buying the additional at LME Average or some other higher figure. My opinion is that this would help everybody, leave no hard feelings among the fabricators, leave no ruffled feathers among the fabricators' customers and still keep the fabricators supplied. It would be far better than the present system of a regular market and a so-called "gray" market.

★ ★ ★

So much for the method of pricing. Now, what of the future price of copper? In order to meet publication date this article was written at the end of March, 1955. For the record,—supply is short, the demand is high, the price is thirty-six cents (36c) as set by the Primary Producers, with some of them charging about one cent (1c) more for wire rod, to compensate for premium copper they are forced to buy.

★ ★ ★

My own thinking is that so long as the present pricing system exists, the demand, while remaining strong, will subside from the riot stage and settle down to the "good steady" type. The supply will increase as the South African troubles are remedied; the Rhodesian mines are now back into full scale production. While no weakness should develop because of continual fears of American and Chilean labor strikes in the late Fall, it is my opinion that the balance between supply and demand should not be reached until the third (3rd) quarter of 1955 because inventories must be brought back to normal size, even if demand falls off. The LME price should react permanently as 1955 moves on and this index should lose its importance as a world price setter. When this happens the American Smelters will be glad to sell their product in this country, as will Chile. Once that is achieved it is my opinion that the United States Producers will gradually drop back to a thirty-three cents (33c) price. Of course, there are those who feel that the shortage will not be over until the London price equals the American

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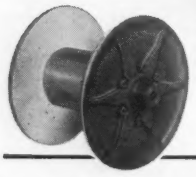

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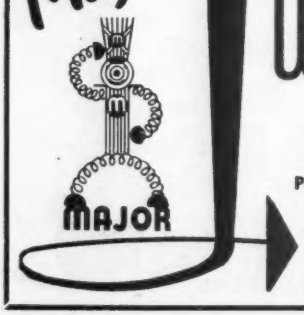

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price. But these prognosticators are unable to guess whether the London price will come down to the American level, or the American level will go up to the London level. I, for one, am more inclined to feel that the thirty-six cents (36c) level of copper is approximately the peak. Strikes in the automobile industry would ease the demand from that quarter, but on the other hand if the labor unions in the American mines insist upon a guaranteed annual wage, we might well have prolonged strikes in the late Summer, which could throw out all calculations. Obviously, with even a possibility of a war in China in the offing, it is difficult, if not foolhardy, to do too much predicting. Suffice it to say that barring such strikes and war, I feel that the price of copper should tend downwards as we come into 1956. The wisest move the American Producer could make would be to lower the price. Don't underestimate their wisdom, but, on the other hand, don't blame them if they, in turn, are unable, by circumstances, to do so.

★ ★ ★

I have been asked frequently about what is the best way for an insulator to avoid the fluctuations in his own flow of copper. I would say unequivocally from the experience of my own company over the past seven (7) months, that the intelligent approach is for the insulator to find a good independent supplier or suppliers and to stay with such supplier or suppliers throughout the years. Build up with these supply sources an historical position. Thus you have a perfectly valid claim on this historical proportion of copper which he receives. I naturally favor a supplier who is independent and who, in turn, himself has a large position with many different sources of supply. In that way, should one of his sources have difficulties of one kind or another, he can keep you supplied from his many other sources. If you pick a Producer, he may have a strike. If you pick a sales agent or a custom smelter he is forced

by rising prices of scrap, at various times, to sell where he can make a profit and unless you have a signed contract for your entire requirement of copper (which is very hard to predict) there are going to be times when you will find this supply source unable to take care of all your needs. The average independent wire mill has many annual contracts and has a better ability to gauge its consumption for future periods. It can at least take care of the major portion of your requirements. The individual insulator's purchasing agent can not be expected to be an expert in the copper market—it is too much of a time consuming process. He therefore is much better off in leaving his supply situation to the independent wire mill buyer, who is an expert and who can devote his entire effort to the supply problem.

Stainless Safety Lock Wire in Toolbox-Packages

Manufacturers using safety lock nuts—now can get stainless safety lock wire in toolbox-size packages.

★ ★ ★

National Standard Company, Niles, Michigan, is making this stainless steel wire product available in 1, 5, and 10-pound spools, shipped in minimum lots of 100 pounds. The wire is wound on disposable spools—plastic for the 1-pound packages, and metal for the 5 and 10-pounders—for even greater convenience in use.

★ ★ ★

National Standard is producing a complete range of wire sizes, from 0.020 to 0.067-inch, in the new small-unit packaging program. The stainless is made to four different government specifications: —QQ-W-423; AN-W-23; AN-W-24; and AMS-5685-C.

★ ★ ★

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The Influence of Nail Design and Manufacturing Practices on Joint Strength

(*Continued from page* 666)

sumed to be twice the value of the joint in single shear.[9]

Roll Threading Defects

Roll threaded nails are subject to certain defects, the avoidance of which would require 100% inspection of the product. Two such defects are shown in Groups B and C in Photo No. 11. There is, between the good and poor forms, a difference in immediate holding power of nearly 40%, and an even greater amount after seasoning.

★ ★ ★

In the underlay flooring nail samples at the left of the photo the defective sample has a poorly defined buttress thread form which caused a reduction in holding power of nearly 50% below well threaded samples. This defect was caused by the use of badly worn dies.

★ ★ ★

It is frequently noted that Prutton roll-threaded nails have widely divergent holding power due to four and five start nails being produced within the same lot and with the same dies. This is caused by poor starting and slippage at the threading entrance. In one example of this defect which we examined, those samples which had 5 starts had an immediate withdrawal value approximately 30% below the identical 4 start samples. This is in accordance with the ratio of tangents of angles so produced, as discussed under the section on "The Effect of the Angle of Deformation."

★ ★ ★

One advantage of the "ARDOX" process lies in the ease of inspection of the threaded wire coils prior to nail making.

Summary

Research conducted during the development of an improved common nail has permitted a close study of some of the factors which influence the strength of nailed timber joints.

★ ★ ★

We have shown in this paper that the factors of design which

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influence the holding power of timber joints are:

(a) The length of the nail
(b) The surface area of the nail
(c) The angle of helix
(d) Change of friction coefficients by cement coating, etching, barbing or oxide coatings (heat treatment).
(e) The depth of threading, i. e. the difference between root and crest measurement.

★ ★ ★

We have also shown that driveability is a function of the type of point, the cross sectional area of the nail and the tendency to bend; this latter we can avoid by proper design using an $\frac{l}{r}$ ratio similar to column design adjusted by tensile ratio.

★ ★ ★

While for effective usage the most important features of the helical nail are crest angle, ratio, and measurement, we have found that, in practice, an effective crest angle may be set up for each individual nail gauge, thereby simplifying the entire design. In order to compensate for reduced cross-sectional area, and to avoid bending in use, we found it practical, in the case of the "ARDOX" nail, to change the stock analysis from A.I.S.I. 1018 to A.I.S.I. 1035 throughout without imposing undue difficulty on the nail-making operation.

Acknowledgment

The writer wishes to acknowledge the co-operation of personnel of the Metallurgical Laboratory of The Steel Company of Canada, Limited, who prepared the photographs and slides used in this paper, and the Forest Products Laboratory Division of the Department of Resources and Development at Ottawa for permission to use the wood structure photographs, Numbers 3 and 4.

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Fabrication of Resistance Alloys

(*Continued from page* 671)

I have attempted to bring the general scope of my subject to your attention. It is my hope that I have been able to show you how blending of art and science work together in the production of an electric resistant alloy. It is the teamwork of the Foreman's know-how and art of producing combined with the Engineer's scientific knowledge that brings about the end results.

* * *

Those of us in the industry are proud of the part we have played in giving the electrical industry the dependable alloys needed to produce precision equipment. We also realize that in order to justify this pride, we must constantly strive to improve our product. Therefore, whatever improvement there is must necessarily come from the competence, ability and experience of the Workman, Engineer and decisions of Management through whose cooperative efforts the "Fabrication of the Electrical Resistance Alloy" is made possible.

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Hot Dip Galvanizing Is A Science

(*Continued from page* 683)

costs. By making a few sample time studies on the withdrawal times of various articles the withdrawal times can be set within the 15 second—1 minute range, and that range shows the smallest amount of zinc deposited as galvanized coating. On the other hand, with careless withdrawal time, it can be seen at once, the farther the speed of withdrawal goes over 3 feet a minute, and the less time required to get the article out of the metal, the more rapid the amount of metal dragged out of the bath, goes up to left side graph, wasting enormous amounts of good zinc. In addition the quality of the coating deteriorates on both ends of the graph, the one from excess metal dragged out, a heavy thick coating, and the other from too long a sub-

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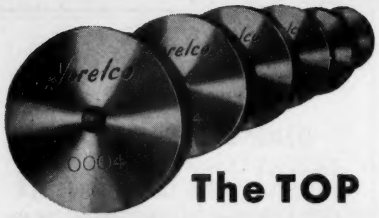

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mersion time, which also gives an excessively heavy coating which is due to extreme alloying action of the molten zinc bath on the iron of the base metal.

★ ★ ★

In conclusion it has been definitely proven, both in the laboratory, and also under practical operating plant conditions, that "It is a definite scientific principle that the faster the withdrawal time, the heavier the zinc will be deposited as galvanized coating, and for every article there is a minimum speed of withdrawal that will give the lightest deposit of zinc as galvanized coating. If the speed is slower than this minimum withdrawal time, then the alloying process sets in, and the weight of zinc deposited as galvanized coating increases in proportion to the time that the article remains in the molten zinc bath."

New Wire & Cable Developments Revealed by NEMA

(*Continued from page* 687)

cussed the decline in the business man's importance and influence with the public, and explained how this has affected industrial relations.

Operation "Hailstorm"

"Exercise Hailstorm," the war maneuvers conducted by the Fifth Army at Camp Hale in the Rockies last February, was discussed by **E. Mark Wolf** of the **Rome Cable Corporation.** He said the objective was to test personnel, equipment and their capabilities and limitations in mountainous terrain under conditions of severe cold and high altitudes.

★ ★ ★

He described the work of a team of eleven men, six representing the electronics industry and five representing the wire and cable industry during the maneuvers. They observed the installation and operation of military communication equipment under simulated combat conditions at high altitudes and sub-zero temperatures in the

It is with regret that we announce the death on April 22nd, 1955 of

Mr. Louis Chambre

Vice-President and General Manager of the Balloffet-Vianney Wire Die Co., Inc. The high standards established by us will be maintained as always and Mr. Chambre's son, Robert, who has been with the company for several years will contact the trade.

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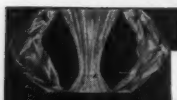
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mountains. The observation team spent the daylight hours with troops in the field. Evenings were devoted to discussions of combat problems with officers directing the maneuvers. The experience should be of inestimable value to the industry in handling technical and production problems which arise in making military equipment.

30-Year Industry Progress

A. J. Nesti, manager of the NEMA Statistical Department, indicated how greatly the insulated wire and cable industry has grown by citing figures to show the contrast. He said that the industry had sold 200 million dollars of products in the open market in 1925. In 1955, the sales have soared to 1½ billion dollars. The continued heavy growth, of utilities, because of constantly increasing power consumption, points to a very bright sales future for the industry in the years to come.

Wire & Cable Section's Growth

A. D. R. Fraser, president of the **Rome Cable Corporation**, and chairman of the NEMA Wire and Cable Section, stated that the Section has expanded by the joining of four new member companies: **American Steel and Wire Division** of the **United States Steel Corporation**; the **Rea Magnet Wire Company, Inc.**; the **Kaiser Aluminum and Chemical Sales, Inc.**; and **Walker Brothers.**

* * *

This large section is representative of the entire register of 571 NEMA member companies, in their desire to promote a spirit of cooperation among the members in attaining improved production, enlarged distribution, and increased efficiency in the use of electrical products.

* * *

Other speakers included **H. N. Blackmon** of **Westinghouse Electric Corporation, H. L. Saums** of **Anaconda Wire & Cable Company**, and **R. L. Reading** of the **Belden Manufacturing Co.**

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Furnace Manufacturer Appoints West Coast Representative

The Gas Machinery Company, Cleveland, Ohio, has announced the appointment of **Heat and Control, Inc.,** as its representative on the west coast for the firm's Industrial Furnace Division.

★ ★ ★

A pioneer in the development and manufacture of gas generating plants and industrial furnaces since 1902, The Gas Machinery Company now has representation in all major industrial areas throughout the United States.

★ ★ ★

Charles A. Blesch is General Manager of Heat and Control, Inc., with headquarters in San Francisco, where the company's main engineering, sales, service, and warehouse facilities are located. The sales and engineering staff—all well known and experienced in the industrial furnace and oven field, and the process heat application industry—is comprised of **James C. Harris, Jr., Clark K. Benson, Andy A. Caridis, Norman O. Schwien** and **Don G. Pedrotti,** all registered professional engineers.

★ ★ ★

Manager of the company's Los Angeles office is **B. Douglass Balthis, Jr.,** who has long been associated with the industrial furnace industry on the west coast. The Seattle office is managed by **Charles B. Cole,** who held the post of Chief Metallurgist of Production Methods Division of North American Aircraft prior to joining Heat and Control in 1953.

Harper Now Has Integrated Operation

With the completion of the metals division at an expenditure in excess of two million dollars, the **H. M. Harper Company,** Morton Grove, Ill., now has a completely integrated operation and is able to produce all types of fasteners in all corrosion-resistant metals from the raw metal itself to the finished product.

★ ★ ★

This is made possible by the installation of melting furnaces, extrusion press and wire drawing equipment built specially to Harper specifications.

★ ★ ★

Stainless steel, brass or bronze is first melted and properly alloyed and then poured into molds to form billets. The outside surface of these billets is removed to provide a clean, smooth surface, and the billet is then heated in an induction furnace to the temperature required for that particular metal.

★ ★ ★

Using the Sejournet process this red-hot billet is then coated with glass to provide insulation and lubrication, and is automatically fed into the extrusion press which extrudes a rod or wire to whatever diameter is called for. Wire is then coiled and rod cut to proper length, treated to remove scale or glass and is ready to be cold drawn to proper size for the manufacture of fasteners.

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Correction

A footnote at the conclusion of Dr. J. A. Giaro's article "Graphic Analysis of the Relation Between the Wire and Capstan Speeds on Multiple Wire-Drawing Machines" appearing in the March, 1955, issues stated that the manuscript had been received in June, 1954 should have read "March 1954."

This is another move in the Harper plan to become completely integrated. Over the years Harper has found great difficulty in securing the various brass and bronze alloys, as well as the various grades of stainless steel in which they work, in specific quantities to meet orders. The new metals division will, to a great extent, assure Harper a dependable source for all these special metals on short notice.

Nopco Opens Warehouse In Portland

The Nopco Chemical Company, Harrison, N. J., has acquired new warehouse and office facilities in Portland, Oregon, and will henceforth be represented in that city by **John J. Ryan,** its Industrial Sales Representative for the Northwest.

★ ★ ★

According to **Perc S. Brown,** the Vice President of Nopco in charge of its Pacific Division, the facilities at 1235 Northwest 12th Avenue are centrally located to all the important markets in the Northwest.

★ ★ ★

Nopco's Northwest representative since 1951, Mr. Ryan worked as a chemist for the company before being transferred to sales, and he has a technical as well as a practical knowledge of the company's products.

New Cable Type Overhead Conveyor System

The current issue of Rope-Ology, issued by **Macwhyte Co.,** Kenosha, Wis., has described a new overhead conveyor system, manufactured by the **Flex-I-Line Conveyor Corp.**

★ ★ ★

This system employs a segmented cable operating on a one-piece trolley bracket on standard monorails. Macwhyte "Safe-Lock" wire rope assemblies are used.

★ ★ ★

The bulletin also contains illustrations and data on other slings and wire rope assemblies. Full information may be secured from Macwhyte by writing for Rope-Ology 554, issue No. 42.

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Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Pacific Coast Borax Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago.
Swift & Company, Chicago, Ill.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

CONTAINERS—Wire Packaging
(See DRUMS—Wire Packaging)

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Mach'y, Inc. (used) Pawtucket. R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

COUNTERS—
(See MACHINERY—Measuring Wire and Cable)

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Michigan.

CUTTING TOOLS—Wire
Porter, H. K. Inc., Somerville, Mass.
Robinson, M. W. Co., Rock Fall, Conn.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Molina-Straus Diamond Products Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
United States Industrial Diamond Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Danforth, The C. W. Co., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Industrial Diamond Powders, Inc., Pittsburgh, Pa.
Kelly Wire Die Corp., New York, N. Y.
Molina-Straus Diamond Products Co., New York, N. Y.
National Research Company, St. Clair Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
United States Industrial Diamond Corp., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING—
Danforth, The C. W. Co., Youngstown, Ohio
Industrial Diamond Powders, Inc., Pittsburgh, Pa.
Kay & Warren Co., Brooklyn, N. Y.
Kelly Wire Die Corp., New York, N. Y.
National Research Co., St. Clair Shores, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIAMOND TOOLS—
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Molina-Straus Diamond Products Co., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Michigan.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Michigan.

DIES—Cold Heading
Carboloy Dept. of General Electric Co., Detroit
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Michigan.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Cochaud Wire Die Inc., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Wire Die Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Elmet Div., Lewiston, Me.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES DIAMOND—Reversible
National Wire Die Co., New York, N. Y.

DIES—Extrusion
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Michigan.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc, New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Cochaud Wire Die Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Ft. Wayne Wire Die., Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
National Wire Die Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Elmet Div., Lewiston, Me.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Michigan.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Wire Packaging
Continental Can Company, Van Wert, Ohio

DRUMS & TRAVERSES—For Cable Reels
Entwistle, James L., Co., Providence, R. I.
Hubbard Spool Co., Garrett, Ind.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

DRYING EQUIPMENT
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Ovens, Inc., Detroit, Michigan.
Rockwell, W. S. Co., Fairfield, Conn.

ENGINEERS—Consulting
Lubricants—Hans C. Bick, Inc., Reading, Pa.
Wire Mill—Clarence S. Arms, Worcester, Mass.
Zinc—Imhoff, Wallace G. Co., Los Angeles, Calif.
Seymour, Leroy D., Trenton, N. J.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FILM—Insulating
Standard Film Products Corp., Pawtucket, R. I.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Drever Company, Phila., Pa.
Rockwell, W. S., Co., Fairfield, Conn.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Heating, Strand
(See Annealing Machines)

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

GALVANIZING EQUIPMENT — (See MACHINERY—Galvanizing Wire)

GRINDERS—Roll
Norton Co., The, Worchester, Mass.

GUIDES—For Wire
Heany Industrial Ceramic Corp., New Haven, Conn.
Lignum-Viate Products Company, Jersey City, N. J.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HARDSURFACING ALLOYS—
(See Alloys—Hardsurfacing)

HOOKS—Pickling & Liming
Lewis Welding and Engineering Corp., The, Bedford, Ohio
Youngstown Welding & Eng'g' Co., Youngstown, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INSULATING MATERIALS—
Carbro Chemical Company, Pawtucket, R. I.
Celanese Corporation of America, New York, N. Y.
Chemical Products Co., E. Providence, R. I.
Electronic Rubber Co., Stamford, Conn.
Monsanto Chemical Co., St. Louis, Mo.
Naugatuck Chemical Div., U. S. Rubber Co., New York, N. Y.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Plymouth Cordage Company, Plymouth, Mass.
Standard Film Products Corp., Pawtucket, R. I.
Synthetic Thread Corporation, Bethlehem, Pa.

INSULATING MATERIALS — Paper—For Electric Wire Cable
Plymouth Cordage Company, Plymouth, Mass.

KETTLES—Galvanizing
National Annealing Box Co., Washington, Pa.

LACQUERING SYSTEMS — See MACH.—Lacquering Electric Wire

LACQUERS—For Electric Wire
Chemical Products Co., E. Providence, R. I.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corporation, Brooklyn, N. Y.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.
Ironsides Co., The, Columbus, Ohio

LUBRICANTS—for Metal Cutting, etc.
Ironsides Co., The, Columbus, Ohio

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Bobbin Winders
Mummert-Dixon Company, Hanover, Pa.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Providence, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co. Philadelphia, Pa.
New England Butt Co., Providence, R. I.
New York Engineering Co., Yonkers, N. Y.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Machinery—Winding Wire)

MACHINERY—Centerless Grinding
Schumag Schumacher Metallwerke, Aachen, Germany.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Closing Rope
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Wells, Frank L., Co., Kenosha, Wis.

MACHINERY—Diameter Testing Continuous
Standard Electronic Research, New York, New York.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Herborn, Germany.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. General Electric Co., Detroit, Mich.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
Wayne Wire Die Co., Hillside, N. J.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Ovens, Inc., Detroit, Michigan
Rockwell Co., W. S., Fairfield, Conn.

MACHINERY—Extruding
Davis-Standard Sales Corp., Mystic, Conn.
Entwistle, James L., Company, Providence, R. I.
Modern Plastic Machinery Co., Lodi, N. J.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Blashill and Company, Arthur, Worcester, Mass.
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.

MACHINERY—Flat Wire
Fenn Manufacturing Co., Newington, Conn.
Mettler Machine Tool, Inc., New Haven, Conn.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming Wire
Baird Machine Co., Stratford, Conn.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Michigan Ovens, Inc., Detroit, Michigan
Modern Plastic Machinery Company, Lodi, N. J.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia.
Cook Mfg. Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, O.
Michigan Ovens, Inc., Detroit, Michigan

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Interlocking Fence Co., Morton, Ill.
Mummert-Dixon Co., Hanover, Pa.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Company, Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, James L., Company, Providence, R. I.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Baird Machine Co., The Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Packaging Wire
Coulter & McKenzie Machine Co., Bridgeport, Conn.

MACHINERY—Pickling
Lewis Welding & Engineering Corp., The, Bedford, Ohio
Youngstown Welding & Eng'g Co., Youngstown, Ohio.

MACHINERY—Pin Making
Baird Machine Co., The, Stratford, Conn.

MACHINERY—Pointing
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury Conn.

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.

MACHINERY—Pumps for Molten Metal
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Re-Spooling
Boyd & Sons Manufacturing Corp., Philadelphia, Pa.
Davis Electric Company, Wallingford, Conn.
Emory, Robert J., Co., Newark, N. J.
Federal Manufacturing Co., Wallingford, Conn.
Mummert-Dixon Co., Hanover, Pa.
National Mach'y Exch. (Used), New York.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Rod Mill
Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.
Schumag Schumacher Metallwerke, Aachen, Germany

MACHINERY—Rolling Mill
Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Sales Corp., Mystic, Conn.
Modern Plastic Machinery Co., Lodi, N. J.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Fidelity Machine Co., Phila., Pa.
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Spark Testing
Davis Electric Company, Wallingford, Conn.
Entwistle, James L., Company, Providence, R. I.
Federal Manufacturing Co., Wallingford, Conn.
Modern Plastic Machinery Co., Lodi, N. J.
Peschel Electronics, Inc., New Rochelle, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Straightening & Cutting
Continental Fdy & Machine Co., Medart Division, Pittsburgh, Pa.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Fenn Manufacturing Co., Newington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
American Insulating Mach'y Co., Phila., Pa.
Blashill and Company, Arthur, Worcester, Mass.
Davis Electric Company, Wallingford, Conn.
Davis-Standard Sales Corp., Mystic, Conn.
Entwistle, James L., Company, Providence, R. I.
Federal Manufacturing Co., Wallingford, Ohio
Fenn Manufacturing Co., Newington, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Modern Plastic Machinery Co., Lodi, N. J.
New York Engineering Co., Yonkers, N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes
Federal Manufacturing Co., Wallingford, Ohio
Peschel Electronics, Inc., New Rochelle, N. Y.

MACHINERY—Testing, Physical
Scott Testers, Inc., Providence, R. I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Turks Head
Fenn Manufacturing Co., Newington, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Company, Wallingford, Conn.
Edmands Company, The, Providence, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot)

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

MACHINERY—Winding Wire
Emory, Robert J., Newark, N. J.
Entwistle, James L., Company, Providence, R. I.
Fenn Manufacturing Co., Newington, Conn.
Mummert-Dixon Co., Hanover, Pa.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Wire Drawing
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Fenn Manufacturing Co., Newington, Conn.
Herborn, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
Morgardshammers Mek Verstads AB, Morgardshammer, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Schumag Schumacher Metallwerke, Aachen, Germany
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rock Fall, Conn.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Ovens, Inc., Detroit, Michigan
Rockwell Co., W. S., Fairfield, Conn.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Spelter, Galvanizing, Lead
National Annealing Box Co., Washington, Pa.

PAPER—Creped Wrapping
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—Insulating
Plymouth Cordage Co., Plymouth, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Lewis Welding and Engineering Corp., The, Bedford, Ohio
Youngstown Welding & Eng'g Co., Youngstown, Ohio

PICKLING TANK LININGS—
Chemsteel Construction Co., Inc., Pittsburgh, Pa.
Haveg Corp., Newark, Del.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTICIZERS—
Celanese Corporation of America, New York, N. Y.
Monsanto Chemical Co., St. Louis, Mo.
Naugatuck Chemical Div., U. S. Rubber Co., New York, N. Y.

PLASTICS—for Wire Insulation
Celanese Corporation of America, New York, N. Y.
Electronic Rubber Co., Stamford, Conn.
Monsanto Chemical Co., St. Louis, Mo.
Naugatuck Chemical Div., U. S. Rubber Co., New York, N. Y.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

POTS—Wire Tinning
National Annealing Box Co., Washington, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

PUMPS—Molten Metal
Fisher Associates, New York, N. Y.

REEL AND TENSION STANDS—
Davis Electric Company, Wallingford, Conn.
Fidelity Machine Company, Inc., Philadelphia
Industrial Ovens, Inc., Cleveland, Ohio.
New York Engineering Co., Yonkers, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS—Plywood
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.
Nelson Company, The, Baltimore, Md.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L. Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wooden
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Nelson Company, The, Baltimore, Md.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RETORTS—Annealing
National Annealing Box Co., Washington, Pa.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Steel
Crucible Steel Co. of America, Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Chase Brass & Copper Co., Waterbury, Conn.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Titan Metal Manufacturing Co., Bellefonte, Pa.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Sheffield Steel Corp., Kansas City, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

ROLLS—Wire Straightening
Lignum-Vitae Products Corp., Jersey City, N. J.

ROPE—Wire
American Steel & Wire Company, Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

SATURANTS—Cable
Carbro Chemical Company, Pawtucket, R. I.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

SHEAVES—Wood
Lignum-Vitae Products Corp., Jersey City, N. J.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—(See Reels & Spools)

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

TANKS—Compound
National Annealing Box Co., Washington, Pa.
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling and Plating
Chemsteel Construction Co., Inc., Pittsburgh, Pa.
National Annealing Box Co., Washington, Pa.

TESTERS — INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper, Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.
Wire Equipment Mfg. Co., Trenton, N. J.

TOOLS—Wire Cutting
Porter, H. K. Inc., Somerville, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Machy—Power Transmission)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES & LACQUERS—for Electric Wire
Carbro Chemical Co., Pawtucket, R. I.
Chemical Products Co., E. Providence, R. I.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Micro Products Co., Chicago, Ill.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Scovill Mfg. Co., Waterbury, Conn.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brass
Chase Brass & Copper Co., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Brush
Spencer Wire Corp., Union, N. J.

WIRE—Bunched & Stranded, Copper
Camden Wire Co., Camden, N. Y.
Utica Wire Corp., Derby, Conn.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Camden Wire Co., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind
Crucible Steel Co. of America, Pittsburgh, Pa.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Titan Metal Manufacturing Co., Bellefonte, Pa.
Wickwire Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Chase Brass & Copper Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.
Utica Wire Corp., Derby, Conn.

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Montgomery Co., The, Windsor Locks, Conn.

WIRE—Galvanized
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
National Standard Company, Niles, Mich.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark, N. J.
North American Philips Co., Inc., Elmet Division, Lewiston, Me.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
Titan Metal Manufacturing Co., Bellefonte, Pa.
U. S. Steel Corp., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland, Ohio
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
Spencer Wire Corp., Union, N. J.

WIRE—Needle
Carpenter Steel Company, Webb Wire Division, New Brunswick, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., The, Cleveland, Ohio
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Oil Tempered
Crucible Steel Co. of America, Pittsburgh, Pa.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.

WIRE—Silver Plated Copper
Camden Wire Co., Camden, N. Y.

WIRE—Special Shapes
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Spring
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Carpenter Steel Company, Webb Wire Div., New Brunswick, N. J.
Crucible Steel Co. of America, Pittsburgh, Pa.
Firth Sterling, Inc., Pittsburgh, Pa.
Major Co., J., Chicago, Ill.
National Lock Washer Company, The, Newark, N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Steel—Also Coppered and Galvanized Steel
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Major Co., J., Chicago, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Major Co., J., Chicago, Ill.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Tinned Copper
Camden Wire Co., Camden, N. Y.
Spencer Wire Corporation, Union, New Jersey
Utica Wire Corp., Derby, Conn.

WIRE—Tungsten
North American Philips Co., Inc., Elmet Division, Lewiston, Me.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.
Lignum-Vitae Products Corp., Jersey City, N. J.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARNS & TAPES—Insulating
Celanese Corporation of America, New York, N. Y.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Standard Film Products Corp., Pawtucket, R. I.
Synthetic Thread Corporation, Bethlehem, Pa.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

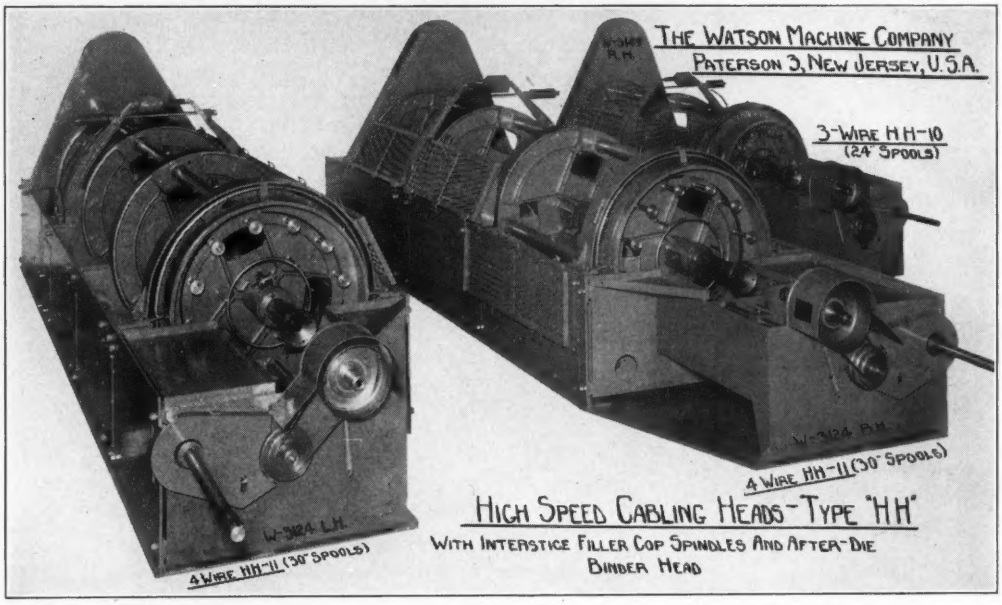
PATERSON 3, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE AND MASTICATING MACHINERY MANUFACTURERS

WATSON

HIGH SPEED CABLERS TYPE "HH"

MAXIMUM PRODUCTIVITY IN THE MANUFACTURE OF TWO-, THREE-, OR FOUR-CONDUCTOR CABLES IS OBTAINED BY THE USE OF THIS DESIGN. HIGHEST SPEEDS, FREE ACCESS TO ALL ADJUSTMENTS, AND GUIDE POINTS WITH A MINIMUM OF MAINTENANCE ARE A FEW OF THE MOST OUTSTANDING ADVANTAGES.



HIGH SPEED CABLING HEADS - TYPE "HH"

WITH INTERSTICE FILLER COP SPINDLES AND AFTER-DIE BINDER HEAD

UNITS ARRANGED WITH PATENTED "SHAFTLESS", NO-LOOSE-PART CRADLES OR CONVENTIONAL SHAFT TYPE CRADLES IF A WIDE VARIETY OF SPOOL SIZES MUST BE LOADED. EASILY ADJUSTED NYLON FRICTIONS.

BALL BEARING ROTOR IS ALL STEEL AND CHROME MOLYBDENUM ALLOY. SPACE SAVING, VEE BELT DRIVE DIRECT TO ROTOR. RIGID ALL STEEL BOX FRAME FACILITATES INSTALLATION AND INSURES PERMANENT ALIGNMENT. AUTOMATIC SPRING-SET AIR-OFF BRAKES. QUIET, PHENOLITIC SUPPORT ROLLERS ON ADJUSTABLE ECCENTRIC MOUNTS. GUIDES TO SUIT PRODUCT.

GUARDED FILLER COP MOUNTS AND MULTI-SPEED BINDER SERVER AFTER DIE, IF SPECIFIED.

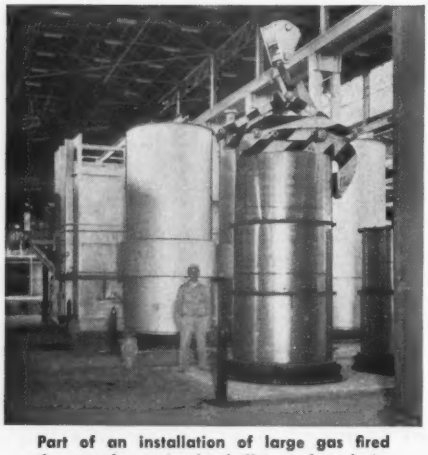
AVAILABLE IN THREE SIZES: FOR 24" x 14", 30" x 16" and 40" x 20" spools.

CAPSTANS AND TAKEUPS TO COMPLETE THE MACHINES AVAILABLE IN MANY TYPES AND SIZES.

6-55

Two large EF combination gas fired and electrically heated furnaces for uniformly annealing, normalizing, and galvanizing strip—continuously.

designed engineered and *Specially Built*



Part of an installation of large gas fired three-stack rectangular bell type forced circulation special atmosphere furnaces for annealing strip.

for continuous and batch processing of ferrous and non-ferrous strip.

We are in position to design, build and put into operation: continuous or batch type equipment for hot or cold rolled, high or low carbon steel, stainless, silicon, tinplate, aluminum, brass, bronze or any other ferrous or non-ferrous metal—for bright annealing, normalizing, galvanizing, aluminizing, tinning or any other process—in the size and type best suited to your plant, process, product or production requirements. No job is too large or too unusual.

Put your production furnace problems up to experienced engineers—it pays.

THE ELECTRIC FURNACE CO.

GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION

Salem - Ohio

Canadian Associates • CANEFCO LIMITED • Toronto 1, Canada

This large EF combination electric and gas fired installation flame cleans, uniformly anneals and galvanizes strip continuously.